

+GF+ Contain-It

**9**

Easy and Reliable Secondary Containment Piping System

- **Split Pipe and Fittings**
- **Solid Pipe**

Not for Use with Compressed Air or Gases

George Fischer, Inc. DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above or below ground locations. The use of George Fischer, Inc. products in compressed air or gas systems automatically voids George Fischer, Inc. warranty for such products, and their use against our recommendation is entirely the responsibility and liability of the installer. George Fischer, Inc. will not accept responsibility for damage or impairment from its products, or other consequential or incidental damages caused by misapplication, incorrect assembly, and/or exposure to harmful substances or conditions.

Threaded fittings are not recommended for pressure applications.

For more information about any of our product lines, please call (800) 854-4090.

Table of Contents

Overview	9.4
Installation Instructions:	
Equipment needed for assembly	9.6
Solid pipe preparation	9.6
Solid pipe installation.....	9.6
Split pipe preparation	9.7
Pipe clamp usage instructions	9.8
Split fitting assembly	9.9
Preparation for injection	9.9
Instructions for pneumatic injection gun	9.10
Instructions for manual injection gun	9.10
Cold weather instructions	9.11
Injection of split pipe	9.11
Injection of split fittings	9.11
Containment of flanged systems	9.12
Installation of one piece fittings	9.12
Installation of drainage patterns	9.12
Installation Time Estimate	9.13
Adhesive Requirements	9.14
Thermal Expansion Compensation	9.15
Soil Load	9.16
Support Spacing	9.17
Centralizer Spacing	9.18
Testing	9.19
Repair	9.19
Chemical Resistance Data (for containment purposes only)	9.20
Specification	9.26
+GF+ Contain-It Pipe and Fittings	9.27

+GF+ Contain-It Offers:

- **Split pipe and fittings**
- **Fits over virtually any carrier system**
- **Lightweight, easy to install**
- **Clear construction**
- **Interlocking construction**
- **Engineered bonding media channels and flanges**
- **Pre-drilled bonding media injection ports**
- **Quick and easy fitting clips**
- **Predetermined fitting clip locators**

Applications

Chemical Process Industry

The retrofit capability and chemical resistance of +GF+ Contain-It make this an ideal choice for containment piping of chemical process lines.

When you combine the advantages of +GF+ Contain-It with George Fischer's complete line of thermoplastic piping systems, you'll see that you can use "one source" for all your process and waste piping needs.

Environmental Protection Requirements

Federal, state and local regulations have been created to protect our environment from industrial pollution. Many of these regulations provide criminal penalties for owners, managers, and employees for environmental damage caused by chemical spills and leaks. For example, the Clean Water Act allows fines of \$25,000 to \$50,000 per day of violation and prison terms of one to three years.

Industry has been assessed clean-up expenditures which far exceed the costs to install protective measures. When penalties and fines are added to the costs of cleaning up spills and leaks, it becomes obvious that industry has a legal and financial responsibility for protecting our environment. George Fischer's Secondary Containment System provides the necessary environmental protection at a fraction of potential clean-up costs. The system includes many features which yield benefits to the owner, engineer and installer.

Split Pipe and Fittings

With pipe split along its length, the +GF+ Contain-It piping system can be installed over virtually any tested carrier system. The carrier system can be tested without interference from the containment piping. Any leaks found during testing can be easily repaired. Leak detection cable can be installed as the split components are assembled, eliminating the need for time consuming cable pulling or the inclusion of lines to pull the cable. Containment piping can be retrofitted over plastic and metallic systems above and below ground, protecting employees, equipment and the environment. Split Pipe and Fittings are available in 4" and 6".

Solid Pipe

Solid pipe may be combined with split fittings in installations which do not require retrofit capability or where it is preferred to pull a leak detection cable. Solid Pipe is available in 4" and 6".

Flexible Adapter

Flexible adapters allow connection to metal or chemical resistant plastic carrier systems other than PVC.

Centralizer

Centralizers center and support the carrier pipe. They are available for IPS and metric, for one or more carrier pipes.



Split Pipe and Fittings

Solid Pipe

Flexible Adapter

Centralizer

Clear Polyvinyl Chloride Construction

The clear construction allows for total inspection of the annular space which, in above ground installations, may eliminate the need for expensive leak detection systems. Polyvinyl Chloride's chemical resistance, high tensile strength and good impact resistance provides a material that is suitable for a broad range of applications. +GF+ Contain-It PVC secondary containment system is suitable for the intermittent and short term exposure found in containment piping.

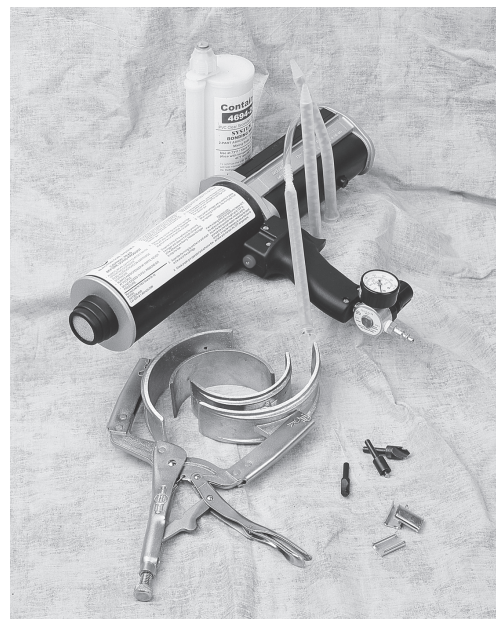
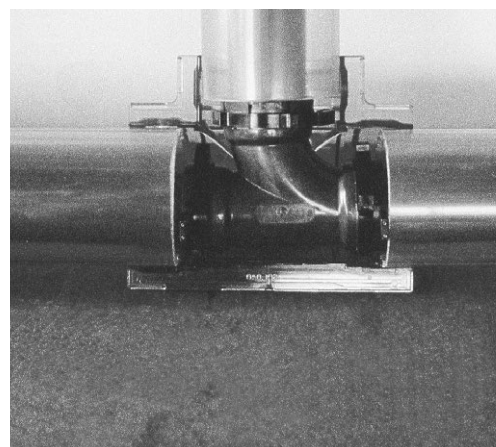
Few Tools Needed

+GF+ Contain-It requires fewer and less expensive tools than other containment piping systems. With +GF+ Contain-It, there is no fusion welding, eliminating the need for those tools which simplifies the installation procedures. Except for the common pipe preparation tools, all you'll need for +GF+ Contain-It are the following.

- *Fitting Clips and Hammer* — we provide the clips to hold the fittings in place prior to bonding. The hammer is used to drive the clips into place.
- *Pipe Clamp* — helps you snap the split pipe together.
- *Drill and Counterbore Drill Bit* — to drill injection ports when needed.
- *Injection Gun* — to inject bonding adhesive into the fittings.

Injection Bonding System

The Injection Bonding System provides a controlled application of the bonding media, eliminating the mess usually associated with brush applied resins and solvent cements. Furthermore, fusion welding is eliminated allowing installation using less expensive tools. The bonding media is injected into the length of the split pipe to provide a pressure rated leak free seal.



Pressure Rated

The +GF+ Contain-It system can be air pressure tested or, if preferred, a hydrostatic test may be specified.

Dim.	with Air	with Water with flex. Term. Fitting with Female Adapter	with rigid Term. Fitting
4"	5 psi (0.3 bar)	5 psi (0.3 bar)	32 psi (2.2 bar)
6"	5 psi (0.3 bar)	5 psi (0.3 bar)	32 psi (2.2 bar)

Installation Instructions

Equipment Needed For Assembly

- Fine tooth saw and miter box or chop saw with fine tooth blade
- Tubing cutter with wheel designed for plastic pipe (solid pipe only)
- File or pocket knife for deburring
- Pipe clamp (for split pipe assembly)
- Hammer
- Electric or battery operated hand drill
- Counterbore drill bits
- Crossover hole drill bits
- Pneumatic adhesive injection gun (air supply not to exceed 73 psi inbound air pressure) with air regulator gauge and hose assembly (0-100 psi gauge range) or manual adhesive injection gun
- Flash light and mirror
- Hot box for cartridges and heat blanket wrap/hot air heater for split pipe (for low temperature applications)

Solid Pipe Preparation

1. Determine pipe length via typical on site measurements.
2. Cut pipe. **Square cuts are important.** Solid pipe may be cut with a tubing cutter designed for cutting plastic pipe.
3. Deburr pipe ends using a knife blade or file.
4. Wipe pipe end with a clean, dry cloth.
5. Prior to installing solid pipe, install centralizers on primary pipe (see page 9.18).

Solid Pipe Installation

The exclusive use of solid Contain-It pipe may result in difficulty when joining the primary piping. Therefore, the installer should determine the ease with which the primary pipe fittings may be assembled within the Contain-It system. Pipe fittings must have enough room for the joining method.

There are two methods by which the primary pipe fittings will be accessible enough for proper installation. Both methods are illustrated on page 9.7.

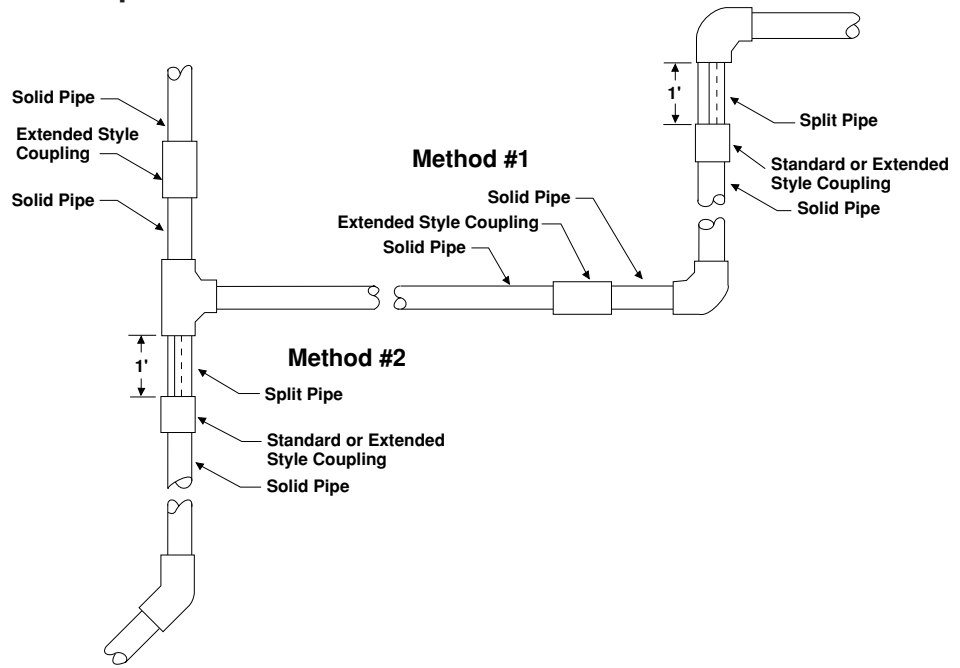
Method #1:

Utilizes solid pipe and at least one extended style coupling along a pipe run.

Method #2:

Utilizes split pipe with either a standard or extended style coupling along a pipe run.

Solid Pipe Installation

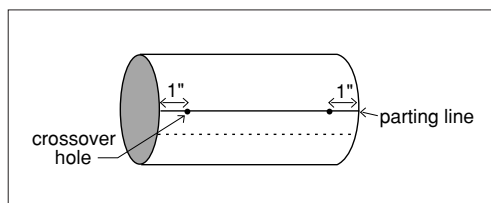


Split Pipe Preparation

1. Determine pipe length via typical on site measurements.
2. Cut pipe. **Square cuts are important.** Split pipe requires the use of a saw and miter box or a chop saw with a fine tooth blade.
3. Deburr pipe ends using a knife blade or file.
4. When using split pipe, a parting seam can be seen (and felt) where the pipe separates. **When cutting any split pipe for preparation/installation in the field, a crossover hole has to be drilled into this seam, on the cut end, and located within the bonding channel of the fitting.**

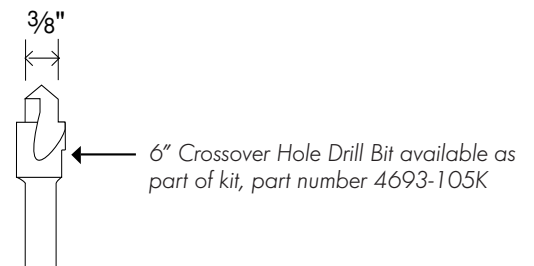
These locations are:

- **For most fittings** — the crossover hole must be drilled 1" from each end of the pipe length.



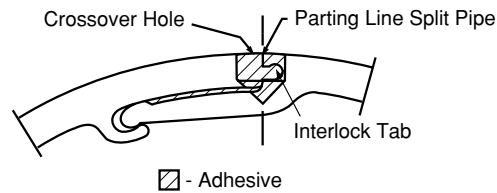
- **For extended style couplings** — based upon varying pipe insertions, the location of the crossover hole is to be determined so that it is located within the bonding channel of the fitting.

Note: The crossover hole drill bit for 6" split pipe is identified by a flat surface ground on one side of the bit as shown below.



5. The failure to properly drill crossover holes when using split pipe will result in leaks during a pressure test. If you are not completely sure of this procedure, **STOP IMMEDIATELY** and contact George Fischer Technical Service Department at (800) 854-4090.

6. Inspect the crossover hole for complete removal of the interlocking tab and any obstructions that may affect adhesive flow.



7. Prior to assembling split pipe, install centralizers on primary pipe (refer to page 16 of Contain-It Technical Manual).
8. Snap split pipe together for its full length using the pipe clamp (see below for more information) to insure full interlock of the tongue and groove seam.
9. Wipe pipe end with a clean, dry cloth.

Pipe Clamp Usage Instructions

Normally Contain-It split pipe can be hand assembled by pressing the halves together. However, in some cases, additional force may be required to fully engage the Contain-It split pipe seam. The Contain-It pipe clamp provides the additional force for assembling split four inch and six inch pipe.

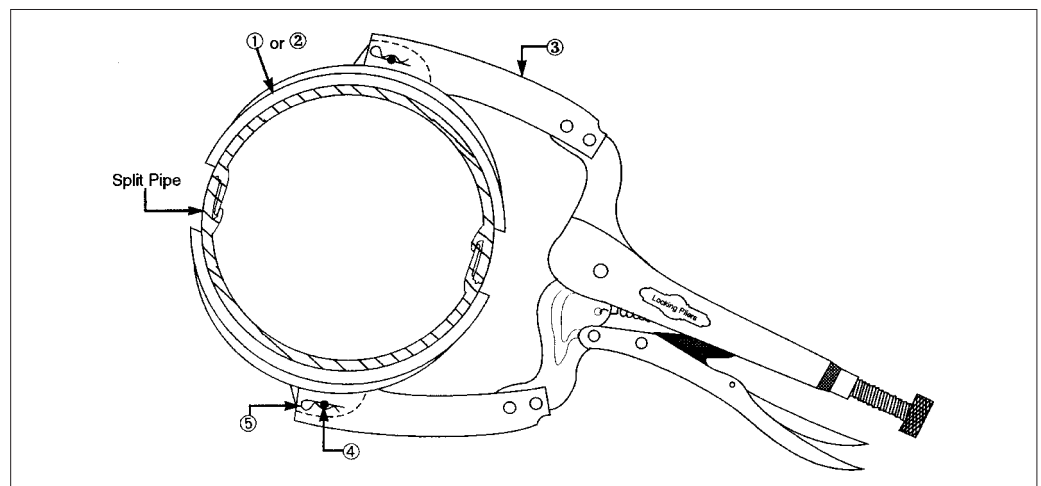
Assembling Clamp Halves

Four inch and six inch clamp halves are furnished and are readily inter-changeable by following this procedure:

1. Remove both hair pin cotters (5) from the clevis pins.
2. Remove the clevis pins (4).
3. Remove clamp halves (1 or 2) from the locking pliers.
4. Insert appropriate clamp halves with clevis pin hole facing forward in the locking pliers arm as shown in the drawing. The clevis pin hole (5) should be positioned forward on the clamp half, so that the tab does not extend past the pliers (3).
5. Replace clevis pins and hair pin cotters.
6. To adjust the pipe clamp, open the locking pliers and **position pipe all the way back in the clamp jaws** with pipe seams centered in the jaw openings. Close the locking pliers and adjust screw until clamp fits firmly on the pipe. Open locking pliers and tighten adjusting screw one to one and one half turns. This adjustment should provide sufficient force to press the pipe halves together.

Using the Pipe Clamp

The pipe clamp is now ready for use. Position the pipe clamp, as shown in the drawing, with the pipe seams centered in the jaw openings. Close the locking pliers to exert force suitable to fully engage the split pipe seam. Repeat this operation along the pipe barrel until total engagement is achieved.



Split Fitting Assembly

1. Assemble fitting halves over pipe with the inter-locking fitting surfaces accurately aligned.
2. Install fitting clips on all locators and tap them into place.
 - **For most fittings** — make sure that the pipe is bottomed out in the socket.
 - **For extended style couplings** — make sure each pipe is inserted beyond the minimum depth mark on the fitting. A maximum space of $5\frac{1}{2}$ " may exist between pipe ends.

Note: If split pipe is used with the extended style coupling, it is important that the crossover holes do not align with the bonding channel of the fitting.

9

Preparation For Injection

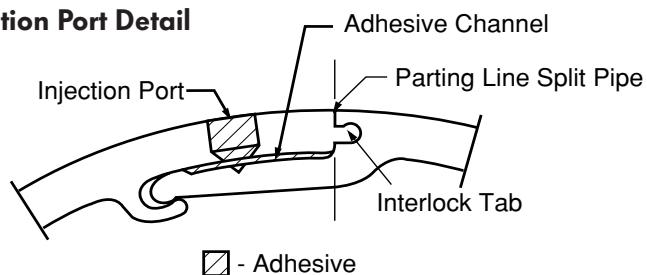
If split pipe is being used, check to see if the predrilled injection ports on the pipe are located close to each fitting. If not, drill new injection ports within 2" of each fitting along the middle of the adhesive channel of the split pipe.

Note: The additional injection ports will allow proper adhesive flow through the crossover holes. The proper drill bits for this operation are:

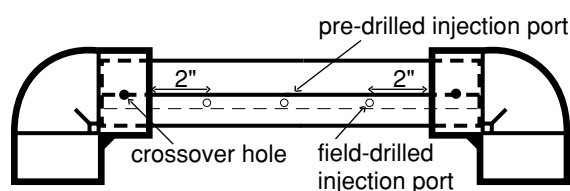
4" dia. — Part No. 4693-104

6" dia. — available as part of kit, Part No. 4693-105K

Injection Port Detail



Injection Hole Location



Instructions For Pneumatic Injection Gun

Caution: Read Before Using Product

- ALWAYS WEAR SAFETY GLASSES WHEN OPERATING DISPENSER.
- READ INSTRUCTIONS ON CARTRIDGE DISPENSER.
- ALWAYS AIM DISPENSER AT PARTS, NEVER AT PEOPLE.
- DO NOT EXCEED 73 PSI INBOUND AIR PRESSURE.

Instructions For Use

1. Connect air supply to injection gun. Set the regulator to 30 psi.
2. Load cartridge into the injection gun by grasping the large tube and inserting the small tube into the injection gun until it snaps in place. The tab between the tubes and the cartridge nut will slide into the grooved metal plate of the injection gun.
3. Remove the nut from the end of the cartridge. This will also remove the plug. Separate the plug from the nut and set the nut aside.
4. Assemble the mixing tip and the nut and attach to the end of the cartridge.
5. Dispense a tablespoon of the adhesive by pressing the trigger and observe that both components of the adhesive are flowing easily and the color and consistency is white and smooth. Release the trigger and press the red button at the back of the handle to stop the flow (the red button releases pressure on the pistons that push out the adhesives).
6. Check proper gun operation and adhesive flow by pressing the trigger. The adhesive should flow easily and the color and consistency should be white and smooth. Release the trigger and press the red button behind the handle to stop the flow. During injection, if adhesive is flowing into the Contain-It secondary pipe or

out of the seams of the Contain-It tongue and groove system, back off the pressure about 5 psi at a time until the situation improves.

7. When finished or when the cartridge is empty, press the red button on the back of the injection gun handle. This will retract the pistons.
8. To remove the cartridge, press the black button on the bottom of the cartridge housing. Grasp the large tube and remove the cartridge from the injection gun.
9. Store partial cartridges with a used tip in place. When reusing a cartridge, the mixing tip must be replaced.

Instructions For Manual Injection Gun

Caution: Read Before Using Product

- ALWAYS WEAR SAFETY GLASSES WHEN OPERATING DISPENSER.
- READ INSTRUCTIONS ON CARTRIDGE DISPENSER.
- ALWAYS AIM DISPENSER AT PARTS, NEVER AT PEOPLE.

Instructions For Use

1. Push the rear lever forward and pull back on the plunger located at the back end of the gun as far as it will allow.
2. Load cartridge into the injection gun by grasping the large tube and inserting the small tube into the injection gun until it snaps in place. The tab between the tubes and the cartridge nut will slide into the grooved metal plate of the injection gun. At this time it is necessary to select the ratio by turning the indicator, located on the side of the gun, to 10:1.
3. Remove the nut from the end of the cartridge. This will also remove the plug. Separate the plug from the nut and set the nut aside.
4. Assemble the mixing tip and the nut and attach to the end of the cartridge.

Note: If work is being done at temperatures below 50°F (10°C), the adhesive should be brought up to 73°F (23°C) to insure the best possible flow viscosity and to promote the chemical reaction necessary for bond strength. It may be necessary to use a hot box to achieve and maintain the 73°F (23°C) temperature.

5. Adhesive flow will begin after pumping the gun trigger several times. Dispense a tablespoon of the adhesive. The adhesive should flow easily and the color and consistency should be white and smooth. Push the rear lever to stop adhesive run-on.
6. When finished, push the rear lever, pull back on the plunger and remove the adhesive cartridge.
7. Store partial cartridges with a used tip in place. When reusing a cartridge, the mixing tip must be replaced.

Cold Weather Instructions

Use of Two Part Adhesive

It is very important that prior to use, the adhesive be brought up or cooled down to 73°F (23°C). At this temperature, the adhesive has its best flow viscosity and the cure cycle is promoted. Above 80°F (27°C) the flow viscosity turns thin. You may have to reduce the pressure of the injection gun to adjust for the easier flow or better keep it in an air-conditioned room until use.

To cure at low temperatures, a heat blanket is available from Bylin Heating Systems of El Dorado Hills, CA. For information call (916) 933-6666 and refer to BHS Part No. HTB-6505). The following table provides guidelines for ambient temperature conditions versus cure times.

***Note:** Before pressure testing, check the adhesive at the last of the injection ports to be injected in order to insure that the adhesive has cured. If the adhesive is soft, lengthen the cure time until it hardens.

Cure Time with Adhesive at 73°F (23°C)

Ambient Temperature	Cure Time (approx.)*
73°F (23°C) (Plus)	6 hours
30°F (0°C)	18 hours
Below 30°F (0°C)	Elevate joint and split pipe temperature above 30°F via heat blankets or hot air heater.

Injection of Split Pipe

1. **Always inject split pipe first.** Insert the mixing tip into the injection port closest to the fitting. The adhesive should flow easily through the adhesive channel. When the adhesive fills the crossover hole, close the valve.
2. Repeat Step #1 for the other side of the split pipe.
3. Repeat Step #1 for both sides of the other end of the pipe.
4. Move along the pipe to the next injection port and inject adhesive until it fills the bonding channel one-half the distance to the next injection port.
5. Repeat Step #4 until the channels on both sides of the pipe are completely filled with adhesive.

Injection of Split Fittings

1. Insert the mixing tip into a pre-drilled injection port around the fitting socket and open the valve handle. Allow the adhesive to flow until it reaches one-half the distance to the next injection port before closing the valve. Continue until the bonding channel is completely filled with adhesive.
2. All split fittings except the standard couplings have additional injection ports in the flange area. After completely filling the bonding channels along the fittings sockets, insert the mixing tip into the injection port in the flange area and completely fill the flange area with adhesive.

Containment of Flanged Systems

Research and Development has determined which size primary flanged systems will fit inside Contain-It. The chart below will be very helpful when recommending our system for this application. Custom centralizers will be necessary. Call for availability and price.

Installation of One Piece Fittings

One piece Contain-It PVC fittings are not designed for injection. To install, simply apply a bead of adhesive to the pipe end and approximately 1" inside the fittings socket and join by inserting the pipe.

Contain-It Size	Primary Pipe Nominal Diameter	Flange OD
4"	1/2	3.520
6"	3/4	3.900
	1	4.270
	1 1/4	4.656
	1 1/2	5.032

Installation of Drainage Patterns*

***Note:** For installation of 4" Fuseal, please contact George Fischer Sloane.

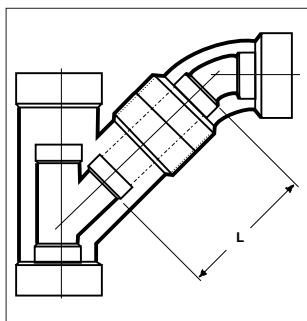
Injection molded drainage patterns which are available for Contain-It and primary drainage systems minimize the need for fabricated fittings. This off-the-shelf capability improves availability and speeds construction. In addition, flow characteristics are improved with injection molded primary drainage fittings.

However, due to differences in laying lengths, only certain primary fittings will fit inside similar Contain-It configurations. The chart below indicates which George Fischer drainage patterns fit inside split Contain-It fittings.

The Long Turn Tee Wyes listed are the only ones that will fit inside Contain-It fittings. If other Long Turn Tee Wyes or combinations are required, they must be assembled from Wyes and 1/8 Bends. The following diagram and chart give guidance on the assembly of primary and Contain-It drainage combinations. The Contain-It pipe that is twice the socket depth of the fittings. The primary Wye and 1/8 Bend require a longer section of pipe. The chart lists the primary pipe lengths required for various configurations.

Combination Contain-It Wye and 1/8 bends

George Fischer Drainage Patterns	Contain-It
1 1/2" and 2" Straight and Reducing Sanitary Tees	4" Tee (4601-040)
1 1/2" Long Turn Tee Wye	
1 1/2" and 2" Wye	4" Wye (4683-040)
1 1/2", 2" and 3" Straight and Reducing Sanitary Tees	6" Tee (4601-060)
1 1/2" and 2" Long Turn Tee Wye	
1 1/2", 2" and 3" Straight and Reducing Wyes	6" Wye (4683-060)



Contain-It is assembled socket to socket with a short piece of pipe. The primary is joined with a short piece of pipe, defined as "L" in the chart.

Combination Contain-It Wye and 1/8 bends

George Fischer Drainage Patterns	"L" Primary Pipe Length	Contain-It Combination
1/8 Bend combined with: 2" Wye 2" x 2" x 1 1/2" Wye 1 1/2" Wye	6" 6 3/4" 7 1/2"	4" Wye + 1/8 Bend (socket to socket) (4683-040 + 4617-040) 4" length of 4" pipe
1/8 Bend combined with: 3" Wye 3" x 3" x 2" Wye 2" Wye 2" x 2" x 1 1/2" Wye 1 1/2" Wye	9" 10 1/4" 10 1/2" 11 3/4" 12 1/4"	6" Wye + 1/8 Bend (socket to socket) (4683-060 + 4617-060) 5 1/2" length of 6" pipe

Installation Time Estimate

To provide a guide for estimating Contain-it installations, the following assembly and adhesive injection times are provided.

Assembly and Injection Time Per Fitting

Part	Number	Time
4" Contain-It Tee	4601-040	3 minutes
4" Contain-It Coupling	4629-040	2 minutes
6" Contain-It Tee	4601-060	4 1/2 minutes
6" Contain-It Coupling	4629-060	2 1/2 minutes

The following two charts (shown at right) show the time required to inject adhesive into split pipe and fittings (at 60 psi inject pressure with the Pneumatic Gun).

4" Split Pipe and Fittings

Part	Time
4" Split Pipe	44 seconds per linear foot
4" Split Fitting	30 seconds per socket
4" Split Tee (3 sockets)	1 1/2 minutes

6" Split Pipe and Fittings

Part	Time
6" Split Pipe	1 minute per linear foot
6" Split Fitting	80 seconds per socket
6" Split Tee (3 sockets)	4 minutes

Adhesive Requirements

Contain-It Cartridge	Fittings/Pipe	# of Sockets/Tube
1 cartridge	4" fittings	14
1 cartridge	6" fittings	10
1 cartridge	4" pipe	20 ft. length, both sides
1 cartridge	6" pipe	10 ft. length, both sides

Adhesive Requirements Calculation

This table is designed to assist in the accurate determination of the number of adhesive cartridges required for a specific project.

Fittings

Quantity of 4" Tees and Wyes _____ x 3 = _____

Quantity of 4" Fittings _____ x 2 = _____
(other than tees and wyes)

_____ /14 = _____

Quantity of 6" Tees and Wyes _____ x 3 = _____

Quantity of 6" Fittings _____ x 2 = _____
(other than tees and wyes)

_____ /10 = (+) _____

Split Pipe

_____ Feet 4" Split Pipe/20 = (+) _____
(1 cartridge will fill 20 ft., both sides)

_____ Feet 6" Split Pipe/10 = (+) _____
(1 cartridge will fill 10 ft., both sides)

TOTAL CARTRIDGES _____

Thermal Expansion Data

Example:

Highest temp. expected - 120°F

Lowest temp. expected - 50°F

Total Change (ΔT) - 70°F

Length of run — 40 feet

From 70°F row, read 1.01

inches length change (ΔL)

Note: Table is based on:

$$\Delta L = 12eL(\Delta T)$$

Where:

e = Coefficient of
Thermal Expansion
 3.0×10^{-5} in./in. °F

L = Length of Run

ΔT = Temperature Change

The change in length of PVC Contain-It pipe with variation should always be considered when installing pipe lines, and provisions should be made to

compensate for this change in length. The following table has been prepared to assist you in determining this expansion.

Thermal Expansion ΔL (in.) — PVC

$\Delta T(^{\circ}F)$	Length of Run (ft.)									
	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'
30	.11"	.22"	.32"	.43"	.54"	.65"	.76"	.86"	.97"	1.08"
40	.14"	.29"	.43"	.58"	.72"	.86"	1.01"	1.15"	1.30"	1.44"
50	.18"	.36"	.54"	.72"	.90"	1.08"	1.26"	1.40"	1.62"	1.80"
60	.22"	.43"	.65"	.86"	1.08"	1.30"	1.51"	1.73"	1.94"	2.16"
70	.25"	.50"	.76"	1.01"	1.26"	1.51"	1.76"	2.02"	2.27"	2.52"
80	.29"	.58"	.86"	1.15"	1.44"	1.73"	2.02"	2.30"	2.59"	2.88"
90	.32"	.65"	.97"	1.30"	1.62"	1.94"	2.27"	2.59"	2.92"	3.24"
100	.36"	.72"	1.03"	1.44"	1.80"	2.16"	2.52"	2.88"	3.24"	3.60"

Depending on the piping material used in the primary and secondary and their material properties (modules of elasticity, coefficient of expansion and allowable stress), many different expansion situations may be encountered. Other considerations should be: installation temperature versus primary operating temperatures versus secondary operating temperatures. There are several methods available for expansion and contraction compensation:

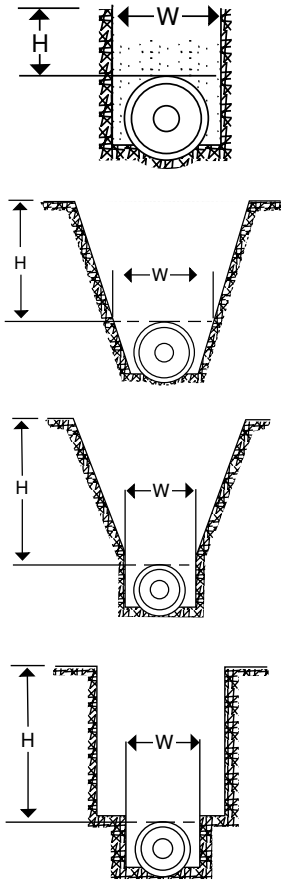
1. Expansion joints can be used in the secondary piping, allowing it to float with the primary system, creating a stress-free system.
2. Stress transfer disks may be placed between the primary and secondary piping, transferring thermally induced stresses incrementally.
3. Larger elbows in the secondary piping at changes in direction can be used to provide extra internal room.

In order to avoid excessive piping expansion that causes interference between the process and the containment piping, piping leg lengths shall be limited to size 4"/2" - 50 feet, and size 6"/4" - 45 feet (inner and outer pipe temperatures @ 125°F). Anything over these lengths will require expansion or absorption devices.

Caution:

Expansion and contraction of the carrier or Contain-It piping can cause a failure of the containment protection system. It is important to adequately compensate for thermally induced expansion and contraction by the use of properly located offsets and/or expansion joints. The annular space must be considered in determining if adequate clearance exists for any carrier movement.

Trench Widths for PVC



W = Trench width at top of pipe

Note 1: Figures are calculated from minimum soil resistance values ($E' = 200$ psi for uncompacted sandy clay loam) and compacted soil ($E' = 700$ for side-fill soil that is compacted to 90% or more of Proctor Density for distance of two pipe diameters on each side of the pipe). If Wc' is less than Wc at a given trench depth and width, then soil compaction will be necessary.

Note 2: These are soil loads only and do not include live loads.

Soil Load

Underground pipes are subjected to external loads caused by the weight of the backfill material and by loads applied at the surface of the fill. These can range from static to dynamic loads.

Static loads comprise the weight of the soil above the top of the pipe and any additional material that might be stacked above ground. An important point is that the load on a flexible pipe will be less than on a rigid pipe buried in the same manner. That is because the

flexible conduit transfers part of the load to the surrounding soil and not the reverse. Soil loads are minimal with narrow trenches until a pipe depth of 10 feet is attained.

Dynamic loads are loads due to moving vehicles such as trucks, trains and other heavy equipment. For shallow burial conditions, live loads should be considered and added to static loads, but at depths greater than 10 feet, live loads have very little effect.

Live Loads for Buried Pipe, lb./ft.

Pipe Size	H 20 Wheel Loads for Various Depths of Pipe (lb./ft.)				
	2 ft.	4ft.	6ft.	8ft.	10ft.
4"	574	154	72	42	27
6"	837	224	106	61	40

Note: H 20 wheel load is 16,000 lb./wheel

Soil Load and Pipe Resistance for Thermoplastic Pipe – PVC Contain-It

Nom. Size	Wc' = Load Resistance of Pipe (lb./ft.)				H (ft.)	Wc = Soil Loads at Various Trench Widths at Top of Pipe (lb./ft.)			
	Solid Pipe		Split Pipe			2 ft.	3 ft.	4 ft.	5 ft.
	E' = 200	E' = 700	E' = 200	E' = 700					
4	426	975	352	901	10	252	297	324	360
					20	328	432	540	551
					30	342	493	603	743
					40	—	506	639	754
6	584	1392	514	1323	10	371	437	477	530
					20	484	636	742	812
					30	503	725	888	1093
					40	—	745	941	1110

Support Spacing

When Contain-It piping is installed above ground, it must be properly supported to avoid unnecessary stresses and excessive sagging. On horizontal runs, hangers or supports should be used at approximately the spacing given.

Note: additional support is required as temperature increases.

The following tables were calculated for 4" and 6" Contain-It with thermoplastic pipe (PVC, CPVC, PP) as the carrier, full of 1.0 specific gravity liquid.

4" Contain-It Support Spacing (ft.)

Temp °F (°C)	PVC, CPVC, PP Carrier Pipe Sizes (inch)					
	1/2	3/4	1	1 1/4	1 1/2	2
60 (15)	10.0	9.8	9.5	9.1	8.8	8.3
100 (36)	9.5	9.3	9.0	8.6	8.4	7.9
140 (57)	9.1	8.9	8.6	8.2	8.0	7.5

Note: Table based on .100 in. deflection of a uniformly loaded, continuous beam.

6" Contain-It Support Spacing (ft.)

Temp °F (°C)	PVC, CPVC, PP Carrier Pipe Sizes (inch)							
	1/2	3/4	1	1 1/4	1 1/2	2	3	4
60 (15)	12.7	12.6	12.4	12.0	11.8	11.3	10.3	9.4
100 (36)	12.1	11.9	11.7	11.4	11.2	10.8	9.7	9.0
140 (57)	11.5	11.4	11.2	10.9	10.7	10.2	9.3	8.5

Note: Table based on .100 in. deflection of a uniformly loaded, continuous beam.

Steel, Fiberglass Support Spacing (ft.)

If the carrier piping is stiffer than thermoplastic piping (steel, fiberglass, etc.), use the following table for hanger support spacing. Place centralizers only at pipe supports. No centralizers are required between pipe supports.

Support Spacing (ft.)

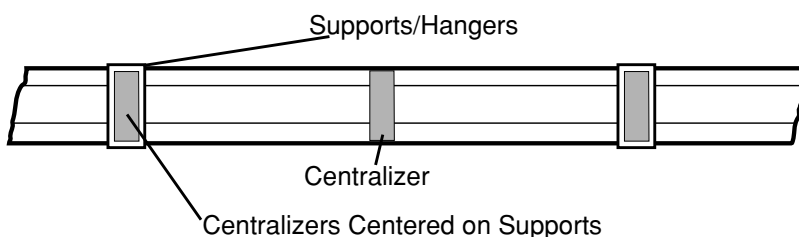
Temp °F (°C)	Contain-It Size (inch)	
	4"	6"
60 (15)	10.6	13.1
100 (36)	10.0	12.4
140 (57)	9.5	11.8

Centralizer Spacing

When thermoplastic piping is used as the carrier system, proper centralizer spacing is necessary to prevent over stressing or excessive sagging. To properly transfer the carrier load to the supports, centralizers should be centered on and, if required, positioned between the supports or hangers.

In the case of elbows and tees, one centralizer is required at the elbow or tee and the next one is spaced in either direction according to the tables.

The following tables are for centralizer spacing when thermoplastic pipe is the carrier pipe.



Maximum Centralizer Spacing (ft.) for Buried Pipe

Temp °F (°C)	Carrier Pipe Sizes (inch)							
	1/2	3/4	1	1 1/4	1 1/2	2	3	4
Schedule 40 PVC								
60 (15)	4 1/4	4 1/2	5	5 1/2	5 3/4	6 1/4	7 1/2	8 1/4
100 (36)	4	4 1/4	4 3/4	5 1/4	5 1/2	6	7	7 3/4
140 (57)	3 3/4	4	4 1/2	5	5 1/4	5 3/4	6 3/4	7 1/2
Schedule 80 PVC & CPVC								
60 (15)	4 1/2	4 3/4	5 1/4	5 3/4	6	6 1/2	8	8 3/4
100 (36)	4	4 1/2	5	5 1/2	5 3/4	6 1/4	7 1/2	8 1/4
140 (57)	3 3/4	4 1/4	4 3/4	5 1/4	5 1/4	6	7	8
Schedule 40 PPFR — Fuseal								
60 (15)	—	—	—	—	4 3/4	5 1/4	6 1/4	6 3/4
100 (36)	—	—	—	—	4 3/4	5	6	6 3/4
140 (57)	—	—	—	—	4 1/2	5	6	6 1/2
Schedule 80 PP								
60 (15)	3	3	3 1/2	—	4	4 1/4	5 1/4	5 1/4
100 (36)	2 1/2	3	3	—	3 1/2	4	4 3/4	5 1/4
140 (57)	2 1/4	2 1/2	2 3/4	—	3 1/4	3 1/2	4 1/4	4 1/2

Note: Table based on .100 in. deflection of a uniformly loaded, continuous beam.

For centralizer spacing for steel or fiberglass pipe, see table on page 15. Use the same spacing for buried steel or fiberglass pipe.

Testing

Final inspection should be accomplished via low pressure air or hydrostatic test as defined in the chart below. This chart gives the pressures allowed.

Fitting	Hydrostatic psi (bar)	Air psi (bar)
4" (with rigid Term. Fit.)	32 (2.2)	5 (0.3)
6" (with rigid Term. Fit.)	32 (2.2)	5 (0.3)
Female Adapters	5 (0.3)	5 (0.3)
Flexible Adapters	5 (0.3)	5 (0.3)

Note: When flexible adapters or female adapters are included, the entire system is rated at 5 psi (0.3 bar), otherwise 32 psi (2.2 bar).

Repair

In the event that an adhesive void is discovered, it can be repaired by drilling into the void with the proper size Counterbore Drill Bit and injecting more adhesive. However, if leaks are discovered where no void is visible, the fitting and/or pipe must be removed and replaced.