POLY-FLO SYSTEMS (DOUBLE WALL)

Single Extrusion Poly-Flo System

Installing any piping system properly requires preplanning. The installation is more than the welding of components. It requires the proper environment, material inventory, welding equipment, tools, and thorough training. This guide is to assist in the planning and installation of a Poly-Flo pipe system either in a pipe rack or trench.

This guide will concentrate on the Poly-Flo system, as supplied by Asahi/America, Inc. The Poly-Flo system is similar to the Duo-Pro and Fluid-Lok systems, with only a few exceptions. The Poly-Flo system is a highly engineered system, manufactured from a single extrusion process, that will provide an economical and dependable performance for any double wall piping application. By the time a Poly-Flo system arrives on site, most of the engineering and design layout work should have been completed.

Asahi/America's recommendations for project management follow.

Step 1. Welding Environment
Step 2. Tool Selection
Step 3. Material Handling
Step 4. Training and Preparation
Step 5. Tool Commission and Daily Checks
Step 6. Pipe Cutting
Step 7. Weld Inspection
Step 8. Hanging
Step 9. Trenching and Burial
Step 10. System Testing
Step 11. Repair Procedures

Step 1. Welding Environment

Asahi/America does not set requirements for proper welding environments. As the installer, it is necessary to choose the environment based on the installation type, timing, or quality goal. In most systems, pipe is either going into a pipe rack, beneath a floor or wall, or buried underground. In all these cases, conducting welds in the actual final location may not always be the most convenient location for welding. In fact, in most cases, it is preferable to prefabricate spool piece components and conduct final welds or hook-up in the pipe rack.

If possible, set up a welding area to build the spool pieces. The weld area should be situated in an area that has reduced exposure to wind, possible rain, and extremely cold temperatures. Building spool pieces inside a weld shop may prove advantageous. A fairly controlled environment and organized work space will improve efficiency and quality of the system to be installed.

Not all welding can be conducted in a shop and eventually field welds will need to be done. Some systems will be installed completely outside, with all the welds perhaps conducted in place.

When welding outside, several factors have to be considered. It is always important not to weld in the rain. Rain will damage equipment and improperly influence the weld. For rainy days, a shelter or tent should be constructed over equipment. In addition to rain, high winds and cold temperatures, below 40° F, will negatively influence the welding process. If these conditions are not avoidable, a heat tent structure is recommended. For specific recommendations by tool type, consult the Asahi/America Engineering Department.

When conducting field welds in a pipe rack or in a trench, it is important to have the location of the welding planned. Vertical welds in any location will prove more difficult to conduct and should be avoided. The field weld that connects up prefabricated spool pieces should be a pipe-to-pipe weld whenever possible. Pipe-to-pipe welds are easier to align and level, making the weld easier to conduct in possibly tight quarters.

In all field welds, in the rack or in a trench, it is important to have ample room for welding equipment and to choose the proper welding equipment. In some underground installations, it may be necessary to increase the width of the trench in weld locations. Many underground systems are welded above ground and then lowered down into the trench to avoid placing equipment in narrow trenches. The same is true in crowded pipe racks. Many times it will prove more efficient to prefab spools and use flanges or unions to connect them together in the pipe rack. Consult Asahi/America for the design and use of a double contained flange.

Step 2. Tool Selection

The selection of the type of welding method conducted on a single wall industrial piping project should be based on the following criteria:

- Material
- Sizes to be installed
- Welding location
- Type of installation
- Available expertise

For assembling Poly-Flo piping systems made from PVDF, PP, and HDPE, there are a few choices of equipment available, each having its advantages and disadvantages. On all of Asahi/America's Poly-Flo containment systems, butt fusion is the only joining system offered. Table F-17 gives data on available welding equipment. There is no one right piece of equipment that can handle all sizes and materials. It is absolutely critical to have the right equipment on site for proper installation.

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Table F-17. Equipment Selection for Poly-Flo (inches)

Description	1 x 3	2 x 3	4 x 6
Shop 4 Miniplast	X	X	
Shop 10 and 12 Manual		X	X
Field 6		X	X
Field 12			X

X = Recommended

Step 3. Material Handling

Shipping

The normal method for transportation of Poly-Flo systems is by truck. The pipe is capped or polyethylene wrapped to protect the ends from damage. Unless sizes prohibit, fittings are boxed and palletized according to the order quantities. Prefabricated spools can often be shipped by flatbed for easier loading and unloading. On large pipe orders, pipe may be palletized and polyethylene wrapped upon request.

Handling and Unloading

Before unloading the truck, a smooth rounded protecting strip should be placed at the end of the truck bed to protect the piping from sharp edges on the truck. The use of any device to remove the pipe that may cause scars, such as end hooks or cable slings, is not acceptable. The piping can be handled with fork lifts by placing the fork lift under the mid-point of the piping. If the piping is stacked on racks, care should be taken to stack the piping to reasonable heights. Stacking to excessive heights may cause the piping to become ovalized, if left in this condition for a long enough period of time. If the piping is placed on the ground, clear the area of any sharp rocks or objects before doing so, and observe maximum stacking heights.

To maintain the purity of the products prior to installation, Poly-Flo pipe should be stored indoors in a site free from excessive dirt and dust. If the products are stored outdoors, they should be covered with a tarpaulin or other protective covering to avoid any possible damage from the weather. Poly-Flo black polypropylene, PVDF, and HDPE are resistant to almost all of the effects of weather. PVDF is completely unaffected by UV light. HDPE, with its black additive, is resistant to UV light, as is Poly-Flo black polypropylene.

Care should be taken to properly support pipe during storage. When storing the piping in racks, close or continuous support should be provided by these racks to prevent permanent deflection of the piping. The piping should not be located near excessively warm areas such as boiler rooms or steam lines. In addition, if the piping is in an area subjected to temperature build-up due to the sun's rays, adequate ventilation should be provided or an alternate site should be selected.

If the pipe is stacked during storage, the heavier pipes of larger dimensions should be stored at the bottom. It may, however, prove more practical to segregate the pipe by size for easier access during the project. Pipe should not be stored above the recommended maximum height of 4 feet.

Fittings are best kept in their boxes or bags, as they are shipped in separate containers by size, style, and material. This will allow for simplified picking and inventory control throughout the project.

Plastic piping should never be subjected to dragging over rugged terrain, as it is able to withstand little mechanical abuse compared to steel. Scarring, cutting, or scratching of the surface may cause a stress point that will lower the impact strength of the piping.

Receiving and Inspection

Asahi/America piping systems are packaged carefully, inspected, and loaded according to the methods previously described prior to shipping. In addition, a detailed packing slip is included with each shipment, listing the quantities of each pipe and fitting and any Proweld equipment and valves. Back ordered items are also detailed on this packing slip, and are shipped immediately upon availability. The carrier assumes responsibility for delivering the product in the same condition in which it was loaded on the truck.

When pipe, fittings and fabrications arrive on site they should be inspected to ensure the proper components have arrived and that no damage has occurred during shipment. Asahi/America goes to great lengths to ensure that pipe and fittings are properly packaged for shipment. If damage occurs, the freight company should be notified immediately.

Upon arrival at the job site, the following receiving procedure is recommended:

1. Check the overall condition of the shipment, paying particular attention to whether the product is neatly stacked and material has not shifted, bounced, etc.
2. If there is visible evidence that the shipment is in disarray, check each and every item for damage.
3. If items are damaged, do not discard. These items must be returned for replacement.
4. Count quantities of all items to see if they correspond with the packing slip. Report any discrepancies immediately.

If piping sustains only minor damage, such as small cuts or gouges, this material may be used without any adverse effect on piping performance. Since Poly-Flo pipe are thermally butt fused, sections containing the minor imperfections can be cut out and the piping re-fused together.

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Step 4. Training and Preparation

Training

A Poly-Flo system is a critical utility within a plant. It is often under flooring or underground where it is not easily accessible. In addition, Poly-Flo systems often are in overhead piping and provide additional needed safety for plant personnel from a leak in a hazardous chemical system. A repair to a system can prove difficult and costly. One bad weld can cause hours of repair and frustration, as well as significant lost revenue. For these reasons, it is critical to receive training at the time of job start-up and use certified personnel throughout the course of a project.

Tool operation is only one of several factors in a thorough training course. Operators, inspectors, and managers need to understand the physical nature of the material: how to properly handle it, how to inspect welds, how to identify potential problems, how to properly maintain equipment, and finally, how best to tie into a line and test it.

All of the above topics are discussed during Asahi/America's certified training sessions. For the installation of a Poly-Flo system, the following training sessions are available:

- Tool Operator Training
- Quality Control Inspection

Both of these can be conducted on site during the time of the start-up. The depth of training in a Poly-Flo piping system is based on the pipe size and location of the system to be installed.

In addition to the above on-site training, Asahi/America also offers courses that are held at the corporate office for the following topics:

- Certified Maintenance and Repair
- Certified Trainer (prerequisites apply)

Consult with Asahi/America's Engineering Department for dates and availability of corporate programs.

During the on-site training process, Asahi/America certified trainers will set recommendations for the class size based on the tool type. In general, groups of four are recommended for the welding operation portion of the training. Typically, two groups can be certified in one day on the welding portion of the seminar. On simple installations, it may be faster; and on more complex installations, it may be longer. To reduce the distraction within the class, it is important that only personnel who will be conducting the weld operation during the project participate in the training. It is also recommended that if a third party QC is used, they also attend the full training course to fully understand the welding process and QC parameters.

Preparation

To best use training time, preparation should be made prior to the trainers' arrival on site. A recommended list of preparations follows.

- Ensure that project material is on site. It is not critical to have all material, but enough to start the project. Once training is complete, it is practical for the trainer to oversee the beginning portion of the installation. Many times new questions and challenges arise once the actual installation starts. In addition, if there is a significant period of time between the training and actual installation, operators may forget portions of the training or different operators may now be slated for the welding operation. Both scenarios require additional training.
- Ensure the required tools are on site. Do not open the tools until a certified trainer is present. If more tools are ordered during a project, this is no longer required as proper unpacking and set up of the equipment is covered in the training process.
- Ensure that the correct power is available. Some pieces of equipment may require 220 Volt single or three phase power supply. Consult with the factory or distributor at the time of tool ordering.
- If possible, have a conference room with an overhead projector available for the classroom portion of the training. If this is not available, select an area where all personnel will be able to see and hear the trainer for this portion of the discussion.
- Ensure that pipe samples are available for the training session. Asahi/America does not normally provide samples for the training.

Formal training can be the key factor in starting a project off in the right direction. Take advantage of this service while on site. Asahi/America also offers field technicians for hire to oversee project welding and training for any specified amount of time. Contact Asahi/America for more information.

Step 5. Tool Commission and Daily Checks

Checking equipment and welding technique daily is recommended. This is particularly important on larger projects where there are many welders on site. This daily check will allow QA to ensure all welders are up to speed on tool operation, welding technique, and inspection. Most problems in the field occur due to improper usage of equipment, rather than equipment failure.

During the initial training of the project, many welds are produced in the presence of a qualified trainer. These welds should be kept and used for the daily checks. Each welder should conduct one coupon test weld and submit it to QA. The coupons should be compared to initial samples. Inspection should include bead formation, sizing, and weld label.

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Conducting preventive maintenance to the equipment at the beginning of each day is required. The maintenance recommended varies on each weld tool type. Consult the Operation Manual for items to be checked daily.

By keeping equipment in good operating condition and ensuring all operators are up to speed, tool problems or welding errors are less likely to occur.

Step 6. Pipe Cutting

Poly-Flo systems cannot be cut using a roll cutter. In most sizes, band saws, vertical or horizontal, will work very well for plastic. Since plastic pipes can have very heavy wall thickness, it is important to travel slowly through the band saw, so as to keep the blade from bending and creating an angled cut. For Poly-Flo pipes up to 2" x 3", a circular blade chop saw will also provide neat and accurate cuts. A miter box chop saw is also very useful if angled welds are to be done in the field.

If only manual saws are available, a hack saw will certainly cut through small dimensions, but avoid using a fine blade, as it will take considerable time. In addition, reciprocating saws are generally not the best choice as the blades are generally only long enough to cut one wall at a time. If too fine a blade is used, the material will become quite hot and can fuse itself back together partially behind the blade travel.

When using power saws to cut Poly-Flo pipe, be sure to use a deburring tool or small sharp knife to clean the ends of the inside diameter and outside diameter of both the inner and outer pipe walls. Also, be sure to deburr the ribs of the Poly-Flo pipe. This is done to ensure good pipe wall welds, as well as to ensure that there is no blockage of the annular space.

Step 7. Weld Inspection

To ensure a safe and on-time system start-up, initiating a standard inspection process on each project is recommended. This quality assurance measure can be conducted by third party QC or can be done by each individual operator after each weld. A recommended inspection report for recording quality assurance on each weld is attached at the end of Section F. Use the recommendation of this weld inspection guide in conjunction with the equipment manual to achieve the best project results.

Butt Fusion

To inspect butt-fusion joints, the inspector should look for the following characteristics on each weld.

- Welds should have two beads that are 360° around the pipe.
- Beads should be of consistent height and width.
- Beads should have a rounded shape.
- Beads should be free of burrs or foreign material.
- A bead on either side should not reduce greatly in width or disappear.
- Components welded should be properly aligned and cannot be misaligned by more than 10% of the wall thickness.
- Pipe ribs should always be offset, not lined up in a continuous way, so as to allow any leaking media to flow to the bottom of the pipe so that it can be detected by a leak detection system.

When correctly welding the inner and outer pipe and fitting simultaneously, the outer bead will provide an accurate depiction of the inner weld. If the outer pipe appears to be improperly aligned, then the inner pipe will also be out of alignment. For simultaneous fusion, it is necessary to ensure that the carrier component is flush in length with the containment component. This can be checked on each part with a straight edge after the planing and prior to the heating step of welding. Other methods include marking the ends of the carrier in four locations, 90 degrees apart, prior to planing. If planing on the containment pipe is complete and all the original marks on the carrier have been removed by the planer, it is then known that both parts are flush.

Butt-fusion beads will vary in size and a little in shape with different materials. In general, PP and HDPE will have larger bead formations in comparison to PVDF. With PP and HDPE, there will be a pronounced double-bead formation that will be simple to identify. With PVDF, there will also be a double bead formation, but not as pronounced, and the material will appear to flow more together, making what appears to be one single weld. However, upon examination, you will always see the seam where the components were joined. In addition, when welding PVDF pipe to fittings, the fitting bead will be larger than the pipe bead. This is normal, as the resin used to produce PVDF fittings flows at a higher rate when melted, as compared to the resin used to extrude pipes. Mechanically, there will not be any issues on strength of the joint, only the appearance of the weld.

Since outside temperature and conditions will have some effect on bead sizes, there is no formal specification for the size of the bead. Also, measuring each bead would be time consuming. During the training process, welding one of each size to use as a rough gauge for the project is recommended. These sample coupons can be referred to on a regular basis to check welding throughout the project.

If bead formations do not meet the inspection criteria, they should be rejected. Consult the operation manual on how to correct the problem for each tool. If problems keep occurring, contact Asahi/America for assistance. Many times these issues can be cleared up quickly over the phone, avoiding waste in time and material.

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Limitations of Inspection
Following proper weld procedures, in conjunction with a thorough inspection process, will lead to a safe and reliable system. However, a weld cannot be 100% judged by viewing it after the fusion is complete. Bad welds with obvious problems can be identified, such as missing beads, small beads, and misalignment, but other problems may not be easily found.

Cold welds occur when an operator either maintains too high a force during the heat soak time, or joins the material at too high a force. The resulting effect is that molten material is pushed to the outer bead, and cooler material is forced together.

The problem with inspecting a cold weld is the outer bead is the same as a good joint. Since the occurrence of a cold weld is difficult to find and inspect, it is important to use proper welding procedures when joining the material. The issue of inspecting and avoiding a cold weld is no different than a PVC joint that has not been primed prior to cementing. You cannot tell after the weld is made, but if you correctly follow procedures, it will not occur. Cold welds can be avoided with the following operating techniques on all butt-fusion equipment:

- Ensure proper heating element temperature throughout the project.
- Use the correct welding parameters by pipe size, wall thickness, and material.
- Do not delay between removal of heating element and joining of material.
- Do not slam material together after heating. Material should be joined quickly, but the pressure build up should be smooth and even. Do not join components together above the joining force.
- If joining force is exceeded during the weld, it is a bad weld. Do not try to back off of the pressure after the weld is made, as the exceeding force will have pushed the weld material out of the joint being made. This can cause a cold weld, resulting in a weakened joint.

Step 8. Hanging

Hanging any Poly-Flo system is not that much different than hanging a metal system. Typically, the spacing between hangers is shorter due to the flexibility of plastic. In addition, the type of hanger is important.

Hangers should be placed based on the spacing requirements provided in Tables F-18 thru F-21. Since thermoplastic materials vary in strength and rigidity, it is important to select hanging distances based on the material you are hanging. Also, operating conditions must be considered. If the pipe is operated at a higher temperature, the amount of hangers will generally be increased. Finally, if the system is exposed to thermal cycling, the placement of hangers, guides, and anchors is critical. In these cases, the hanger locations should be identified by the system engineer and laid out to allow for expansion and contraction of the pipe over its life of operation.

In designing above ground Poly-Flo systems, it is important to use adequate support spacings and reliable hangers. In a Poly-Flo system, support spacings are based on containment piping. The only difference between a double-containment and a single-wall system is the weight per foot will be less than that of the single-wall system when filled with fluid. Based on the carrier piping being filled with water and a maximum deflection of 0.1 inch between supports, Tables F-18 through F-21 will provide proper support spacings for Poly-Flo systems, by size and material, in inches.

Table F-18. Poly-Flo Support Spacing Recommendations* (feet)

Nominal Size (in)	BPP	PVDF	HDPE
1 x 2	5.4	5.5	6.75
2 x 3	6.5	6.7	8.30
4 x 6	9.3	NA	10.00

* Support spacing is based on a liquid with a specific gravity of 1.0.
Correction factors must be used for denser fluids as follows:
0.50 for S.G.=1.25
0.85 for S.G.=1.50
0.75 for S.G.=1.75
0.70 for S.G.=2.00.
Support spacing based on water at 68° F.
Correction factors must be used for elevated temperatures. See Table F-19.

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Table F-19. Poly-Flo Support Spacing Recommendations* (in feet) **for BPP with Temperature Correction Factors Included**

Nominal Size (in)	100° F	140° F	180° F	200° F	240° F	280° F
1 x 2	5.10	4.66	4.12	NA	NA	NA
2 x 3	6.11	5.59	4.94	NA	NA	NA
4 x 6	8.77	8.03	7.09	NA	NA	NA

Table F-20. Poly-Flo Support Spacing Recommendations* (in feet) **for PVDF with Temperature Correction Factors Included**

Nominal Size (in)	100° F	140° F	180° F	200° F	240° F	280° F
1 x 2	4.68	3.91	3.52	2.75	1.65	NA
2 x 3	5.67	4.73	4.27	3.33	2.00	NA
4 x 6	8.08	6.75	6.08	4.75	2.85	NA

Table F-21. Poly-Flo Support Spacing Recommendations* (in feet) **for HDPE with Temperature Correction Factors Included**

Nominal Size (in)	100° F	140° F	180° F	200° F	240° F	280° F
1 x 2	6.41	5.81	NA	NA	NA	NA
2 x 3	7.92	7.17	NA	NA	NA	NA
4 x 6	NA	NA	NA	NA	NA	NA

When hanging a plastic system, it is important to use hangers that will not provide pinpoint loads or other unnecessary stresses on the pipe itself. In general, an adequate hanger or support will have a minimum surface area of one-inch wide supporting the pipe and shall be free of sharp edges and burrs that will abrade and/or cut the pipe. The support shall also provide for axial movement with no lateral movement allowed. Hangers that wrap around the pipe's circumference uniformly or allow the pipe to rest without restraint are recommended. U-bolt style hangers are not allowed unless proper shields are used to prevent point loading.

Hangers that secure the pipe 360° around the pipe are preferred. Thermoplastic clamps are also recommended over metal clamps, as they are less likely to scratch the pipe in the event of movement. If metal clamps are specified for the project, they should be inspected for rough edges that could damage the pipe. Ideally, if a metal clamp is being used, an elastomeric material should be used in between the pipe and the clamp.

Step 9. Trenching and Burial

Proper trenching and burial of a pipe system requires engineering prior to an installation. Asahi/America's *Engineering Manual* (Section C) provides a comprehensive guide to the burial calculations load tolerance of thermoplastic pipe. This information should be supplied and be specified prior to installation. Refer to Asahi/America's manual for the burial calculations.

For installation purposes, it is important to look at several factors as the installer of underground piping.

- Soil conditions should match that of the specification and/or drawings.
- Trenches should be dug according to plan.
- Pipe should be surrounded by specified soil type and compaction.
- Accommodations for welding in the trench should be made.
- Safety issues of being in a trench should always be observed.

For each underground installation, burial designs will specify depth of trench and width of trench. The wider the trench, the more load the pipe will see upon compaction. Therefore, it is important to follow trench design closely to avoid excess load on the pipe. In addition to the trench details, the type of soil becomes important. Different types of soils have different densities and will create varying loads on the buried pipe. If the soil does not match that of the design, it needs to be rechecked or a different top fill may be required.

The surrounding material of the pipe is also important. Items such as large rocks may cause pinpoint loads on the pipe that could eventually damage the pipe. Figure F-110 depicts a recommended cross section of a trench and proper fill material and compaction.

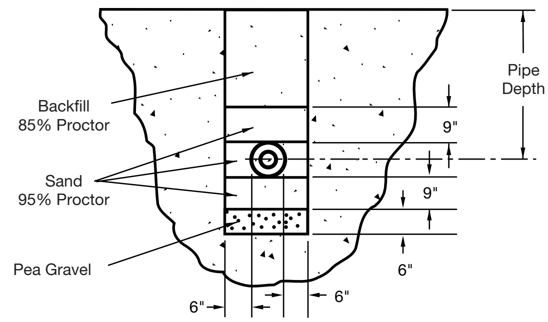

Figure F-110. Trench detail

Welding in a trench should also be preplanned. It is common that all welding is done above ground, and then, the welded components are all lowered into the trench. In many instances, it may be necessary to weld in the trench. For conducting welds in a trench, it is important to allocate space for the machine, as it will be wider than the pipe itself. Widening the trench to accommodate the machine may be required.

Trench Preparation and Considerations

The recommended trench width can be found by adding one foot to the width of the pipe to be buried. Larger trench widths can be tolerated, but trench widths greater than the diameter plus two feet typically produce large loads on the pipe. For small diameter pipes (4" and less), smaller trench widths are suggested. The important point to remember is that the trench width at the top of the conduit is the dimension that determines the load on the pipe. Therefore, the sides of the trench can be sloped on an angle starting above this point to assist in minimizing soil loads in loose soil conditions (prior to compaction). If the trench widths described are to be exceeded, or if the pipe is installed in a compacted embankment, the embedment should be compacted to 2.5 pipe diameters from the pipe on both sides. If this distance is less than the distance to the trench walls, the embedment materials should be compacted all the way to the trench wall.

When installing long lengths of piping underground, it may not be necessary to use elbows, as long as the minimum radius of bending for specific diameters and wall thickness are observed. If the soil is well compacted, thrust blocks are not required. However, if changes of directions are provided with tees or elbows, or if the soil is not very well compacted, thrust blocks should be provided. The size and type of thrust block is related to maximum system pressure, size of pipe, direction of change (vertical or horizontal), soil type, and type of fitting or bend. To determine thrust block area, a geotechnical engineer should be consulted, and soil bearing tests conducted if deemed necessary.

If the bottom of the trench is below the water table, actions must be taken to adequately correct the situation. The use of well points or under-drains is suggested in this instance, at least until the pipe has been installed, and backfilling has

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proceeded to the point at which floatation can no longer occur. The water in the trench should be pumped out, and the bottom of the trench stabilized with the use of suitable foundation material, compacted to the density of the bedding material.

For unstable trench bottoms, as in muddy or sandy soils, excavate to a depth 4" to 6" below trench bottom grade, backfill with a suitable foundation material, and compact to the density of the bedding material. Be sure to remove all rocks, boulders, or ledge at least 6" in any direction from the pipe. At anchors, valves, flanges, etc., independent support should be provided by the use of a reinforcing concrete pad poured underneath the pipe equivalent to five times the length of the flange, valve, or anchor. In addition, reinforcing rods should be provided to keep the appurtenance from shifting, thereby preventing shearing and bending stresses on the piping. It is strongly suggested that an elastomeric material be used to prevent stress concentration loading on the piping caused by the reinforcing rod.

Step 10. System Testing

Procedures for testing installed sections of Poly-Flo systems must take into account factors affecting both carrier and containment pipes. Basic recommendations may be given, but a comprehensive testing program should be developed for each and every system design. The program should be developed based on the requirements and characteristics of the particular system at hand.

Where possible, a test fixture can be used. These testing fixtures allow the testing of both the carrier and the annular spaces from one location with a minimum number of welds.

Water should not be introduced into the annular space. Therefore, a low-pressure air test should be used to test the containment area. **Under no circumstances should an air test exceed 10 psi.** Any air test in excess of 10 psi is extremely dangerous, due to the compressibility of air and the large amount of potential energy that can be released in the event of a catastrophic failure. The carrier should be tested hydrostatically to no more than 1.5 times the maximum operating pressure of the lowest rated component in the system (never to exceed 150 psi).

For all testing, the system must be thoroughly tied down to prevent shock-induced reactions or whipping. All personnel in the area must be kept clear and advised of the inherent dangers of pressure testing. All testing must be conducted prior to a buried system being backfilled.

Annular Test

The system must be properly capped and the test fixture installed. The carrier pipe must, in all cases, be filled prior to any test on the annular space. This is done to ensure that the carrier pipe will not collapse during the test. Pressure gauges should have a small enough scale to be able to detect small changes in air pressure. Charge the annular space to no more than 10 psi. Monitor the pressure gauge. There may be some initial decrease in pressure due to the creep properties of the plastic. Allow at least 30 minutes for the system to stabilize, then re-charge back up to 10 psi. This is considered the beginning of the test. Monitor the pressure for a minimum of 2 hours up to a maximum of 12 hours. If there is a pressure drop in excess of 10% of the beginning pressure, the test should be considered failed. If this occurs, continue to monitor the carrier gauge to determine if the leak is to atmosphere or into the carrier space.

Carrier Test

If the carrier pipe is intended for pressure service, a hydrostatic pressure test must be used.

In any hydrostatic pressure test, provisions must be made to vent all air out of the inner pipe. If necessary, special high-point vents should be used to bleed any trapped air. Air pockets can create a dangerous condition if a cold weld exists and fails during the test. Air pockets can cause rapid and extensive propagation of fault lines should a failure occur.

Filling the system – Again, the piping must be properly capped and the test fixture installed. Water can then be introduced very slowly at the low point of the system. Under no circumstances should the velocity of the water exceed two feet per second, as water hammer can create extremely high surge pressures. The system can then be brought up to test pressure using a hand pump or similar equipment.

Conducting the test – The system should be brought up to test pressure in gradual steps of no more than 10 psi. There may be some initial degradation of the pressure due to the creep properties of the plastic. Allow at least 30 minutes for the system to stabilize, then re-charge back up to test pressure. This is considered the beginning of the test. Monitor the pressure for a minimum of 2 hours up to a maximum of 12 hours. If there is a pressure drop in excess of 10% of the beginning pressure, the test should be considered failed.

Locating a Leak
In the event of a leak in the containment area, it may be possible to diagnose if the leak path is into the carrier or out to atmosphere by monitoring the gauge on the carrier for pressure build up. If the leak is out to atmosphere, the simplest way to locate the leak is by “soaping” the joints. If the leak is into the carrier, then an ultrasonic leak detection gun must be used as described below.

In the event of a leak in the carrier, the pressure should be relieved and the water drained to prevent flooding of the annular space. If the annular space does become flooded, it may be necessary to dry it by purging with dry air or nitrogen (this depends on the type of leak detection used and the requirements of the system owner).

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To determine the location of the leak, Asahi/America, Inc. has ultrasonic leak detection guns available. The gun is capable of hearing airflow through the containment pipe wall. To locate the leak, apply a compressed air charge of no more that 10 psi on the pipe. Using the gun, walk the pipe line placing the gun extension against the containment wall. The compressed air escaping through the leak path will be heard through the earphones of the gun, thus locating the leak. In many cases, the time required to locate a leak is less than one hour.

The customer should supply necessary reducer bushings and fittings. Provisions must be made to accommodate a pressure gauge, bleed valve, shutoff valve, and air/water connection on each end of the tee. The left side of the tee tests the carrier; the right side tests the containment.

Step 11. Repair Procedures

A properly designed, installed, and maintained double-containment piping system will provide years of reliable service. The system, however, should offer the means to perform a repair in the event of a mishap, and this repair should be of such quality that the operating parameters (pressure, temperature) and safety factors are not reduced. The Poly-Flo system offers this capability for all pressure ratings with minimum disruption to site conditions.

The first step in a repair procedure is to isolate the leak source. The ease of finding a leak is determined by the leak detection method selected at the time of installation. The use of a leak detection cable will pinpoint the location of the leak to plus or minus three feet, and is possibly the most efficient system. The low-point sensors will identify a zone that has been contaminated. Further testing methods will be required to determine the location of the actual leak source. Several methods are available for this, including the use of an ultrasonic test gun, fiber optic cameras, and dye solutions. These methods, although more time consuming, are viable alternatives to leak detection cable.

The second step in a repair procedure is to flush the carrier and containment pipes to remove any hazardous chemicals that will create safety concerns for the workers doing the repairs. The ability to flush the system is determined by the initial design. The installation of high-point vents and low-point drains in the containment pipe will provide a safe means to perform the flushing. Attempts to install high-point vents and low-point drains during repair are costly and potentially dangerous.

The third step is to expose the damaged pipe and perform the repair procedure with one of the following methods. The amount of pipe that needs to be exposed will depend on which repair method is chosen. A mechanical, flanged repair will take considerably less exposure of the damaged pipe than a thermal butt-fusion repair method.

F

Repairs to Systems without Flexibility

Flanged Repairs (similar materials)

Poly-Flo systems offer patented, fully pressurized, double-wall flanges that permit the flow of fluids through the annular space, as shown in Figure F-111. (Consult factory for pressure rating.)

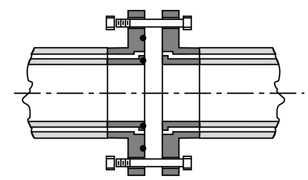

Figure F-111. Poly-Flo double-wall flange assembly

1. The damaged section of pipe is removed first (Figure F-112).

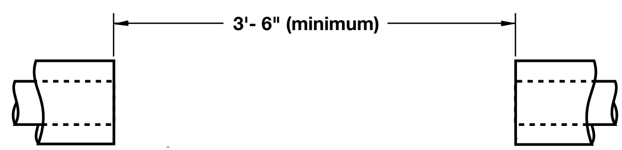

Figure F-112. Remove damaged section of pipe

2. Plane ends. Next, weld two flanges onto the exposed pipe ends.

Figure F-113. Install double-wall flanges

3. A flanged spool piece is fabricated and installed.

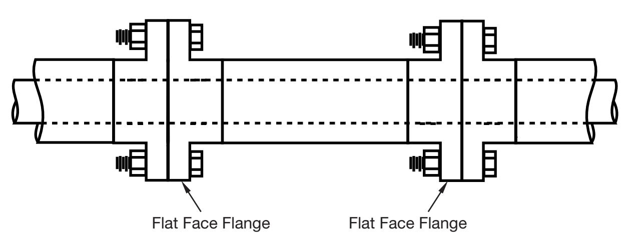

Figure F-114. Install flanged spool

4. The system is then tested and returned to working order.

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Repairs to Systems with Flexibility

Butt-Fusion Repairs (similar materials)

The second method of repair is performed without the use of flanges, but instead, only with thermal butt fusion. The use of butt fusion as the repair procedure requires a larger excavation due to the requirement that the pipe be able to move about one inch to perform the weld.

To perform the repair:

1. The damaged section of pipe is removed and the area cleared to allow the pipe to move in the radial direction. Note that only one end of the pipe needs this flexibility (Figure F-115).

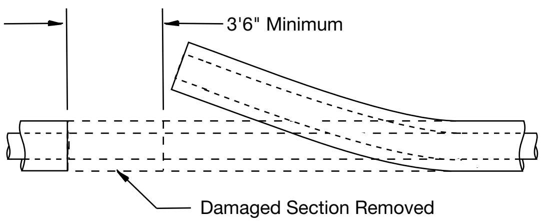

Figure F-115. Remove damaged section of pipe

2. The pipe in the ground is prepared for simultaneous fusion.

3. A spool of pipe is assembled and butt welded to the stationary pipe.

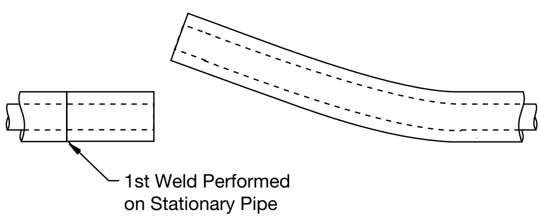

Figure F-116. Install new spool

4. The second weld is then performed on the flexible side.

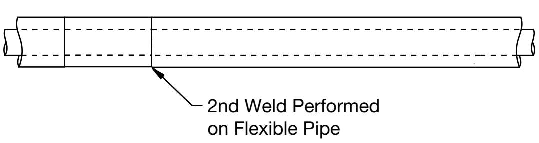

Figure F-117. Butt weld spool to remaining pipe

5. The system is then tested and returned to working order.

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