# Double Containment Piping Systems

Duo-Pro® • Poly-Flo® • Chem Prolok® • Pro-Lock® • Fluid-Lok®
Leak Detection • Welding Equipment

Another Corrosion Problem Solved.™

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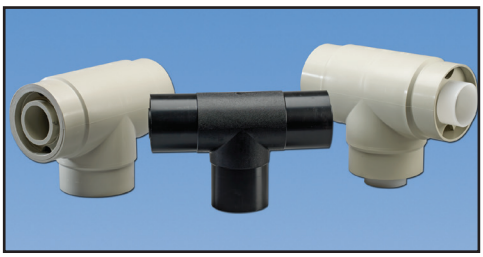
# Environmental Double Containment Solutions



Asahi/America pioneered the market for thermoplastic valves and piping in the United States and Latin America, during a time when there was no viable alternative to metal for piping systems.

Headquartered north of Boston in Lawrence, MA, Asahi/America operates a 200,000 square foot ISO 9001 certified manufacturing and warehouse facility. Asahi/America offers thermoplastic piping systems designed and engineered for tough industrial applications. With our partner, AGRU of Austria, Asahi/America offers double wall piping systems in polyethylene, polypropylene, PVDF, and Halar® (ECTFE).

Asahi/America supports all of our products with a comprehensive selection of in-depth technical documents and product catalogs. To access any of Asahi/America's technical documentation, testing information, or product catalogs, visit our web site at www.asahi-america.com.

# Double Wall Piping System Overview

Double containment piping systems are one of the most economical and reliable methods for protecting against leaks of corrosive or hazardous fluids from primary piping. When designed and applied correctly, double wall systems can be expected to have a long service life. Double contained systems constructed from thermoplastic materials offer significant cost savings and superior chemical resistance over their metal counterparts. A combination of government regulations, increased concern over environmental and personal safety, and a growing fear of litigation has hastened the development and improvement of double contained piping components into highly engineered systems.

The carrier pipe (the inner pipe, also known as the product pipe) material is selected based on common piping practices using variables such as:

- What chemical(s) will be in contact with the system?
- What is the chemical(s) concentration?
- What temperature will the system operate at?
- What pressure will the system operate at?
- What is the flow rate of the media in the system?
- Will there be spikes in temperature or pressure?
- Is there a cleaning operation that the piping will be exposed to?
- Will the system be exposed to sunlight or other sources of UV?

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# Double Wall Piping Systems

**Piping systems engineered to meet the most demanding environmental applications**

Asahi/America offers a full selection of environmental piping systems. We have five unique double containment systems with unlimited solutions.

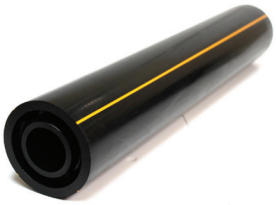
## Poly-Flo®

**Materials**
- Proline® PP-R, Chem Proline® Advanced PE

**Pipe and Fittings**
- 1x1-1/2 (32x50mm), 2x3 (63x90mm) and 4x6 (110x160mm)

**Welding**
- Simultaneous butt fusion

## Chem Prolok® by Asahi/America



**Materials**
- Advanced PE x PE100, Advanced PE x Advanced PE

**Pipe and Fittings**
- 1x3 through 12x16

**Welding**
- Simultaneous butt fusion

**NSF-61-G Approved**

Certified to NSF/ANSI 61-G

## Fluid-Lok®

**Materials:**
- PE 4710

**Pipe and Fittings**
- 1x3 though 24x32

**Welding**
- Simultaneous butt fusion

## Duo-Pro®

**Materials**
- Proline® PP-R, Super Proline® Chem Grade PVDF, Ultra Proline® ECTFE

**Pipe and Fittings**
- 1x3 through 16x20

**Welding**
- Simultaneous or staggered butt fusion

## Pro-Lock®

**Materials**
- PVC, CPVC (Clear PVC also available)

**Pipe and Fittings**
- 1/2x2 through 4x8

**Welding**
- Simultaneous and staggered solvent cement joint

## Leak Detection Systems

For underground pressure systems of hazardous chemicals.

**Options**

Continuous sensing cable, low point sensors, or a combination of components, cable and probes.

- **PAL-AT™:** A continuous leak detection cable system that can also incorporate low point probes.
- **Liquid Watch™:** A flexible, modular low point system based on inline probes.

# Materials

Asahi/America provides our customers thermoplastic piping systems in polyethylene, polypropylene, PVDF, and Halar® materials. We publish an extensive chemical resistance guide to assist the user in selecting the proper piping system for the application. If there is a new application for which we do not have prior experience, we will provide a free spool piece for trial in the actual service, or samples of our piping system materials for immersion testing. After the trial period is concluded, we will inspect and test the material and issue a report on the suitability in the application. Over the years, this trial method has opened up numerous opportunities for our customers to find better piping system alternatives to solve their corrosion problems.

## Polyethylene (PE)

Polyethylene is one of the most common thermoplastic materials. In general, polyethylene's temperature range is 0°F (-18°C) to 140°F (60°C). Polyethylene is easy to install using thermoplastic welding techniques such as socket, butt or electrofusion. It can handle pH from 1-14 and is the most ductile and abrasion resistant thermoplastic material.

## Polypropylene (PP)

Polypropylene (PP) is a member of the polyolefin family. It possesses excellent chemical resistance to many acids, alkalies and organic solvents. PP is one of the best materials to use for systems exposed to varying pH levels, as many plastics do not handle both acids and bases well. Its upper temperature limit is 195°F (90°C) with a limited range extended to 220°F (104°C).

## PVDF

Polyvinylidene fluoride (PVDF) is a high molecular weight fluorocarbon and has superior abrasion resistance, dielectric properties and mechanical strength. These characteristics are maintained over a temperature range of -40°F (-40°C) to 250°F (121°C) with a limited range extended to 302°F (178°C). PVDF is highly resistant to bromine and other halogens, most strong acids, aliphatics, alcohols and chlorinated solvents.

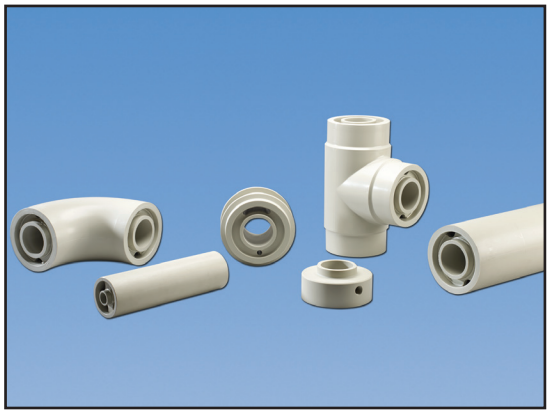
## Halar® (ECTFE)

Ethylene chlorotrifluoroethylene (ECTFE) is commonly known by its trade name, Halar®. ECTFE is a 1:1 alternating copolymer of ethylene and chlorotrifluoroethylene (CTFE). It contains about 80 percent CTFE, one of the most chemically resistant building blocks that can be used to make a polymer. Additionally, ECTFE has good electrical properties and a broad temperature range from cryogenic to 300°F (150°C).

## Duo-Pro® - PP, PVDF, E-CTFE

The premier double containment piping system offered on the market today, Duo-Pro® has been successfully installed in semiconductor, pharmaceutical and chemical processing industries.

Duo-Pro® offers maximum versatility to meet the unique requirements of each individual application. Our mix and match feature allows system designers to specify pipe material and ratings based on media and pressure changes throughout an entire system. Duo-Pro® components are shipped fully fabricated and ready for installation or can be factory prefabricated by trained welding professionals.



## Supply Range

**Standard Sizes:** 1x3 through 24x32
**Materials:** Proline® PP-R, Super Proline® PVDF, Ultra Proline® ECTFE

**Welding Methods:**
Simultaneous or staggered butt fusion, Electrofusion

## Features and Benefits

- Fabricated system made from extruded pipe and primarily molded fittings.
- Complete range of molded pressure fittings that are fabricated at the factory into double containment fittings.
- Designed to provide sufficient space for the installation of leak detection cable.

## Sample Specification

System shall be a double containment piping system of suitable materials and pressure rating as specified. System product pipe shall be capable of transporting stated media under continuous exposure for 50 years. System containment pipe shall be capable of transporting/ holding stated media, in the event of failure of product pipe, for a minimum of 30 days.

Please consult Asahi/America for expanded product sample specification.

## Why Choose Duo-Pro®?

Duo-Pro® has been created to solve all the previously encountered problems in double containment piping.

The system uses proven, highly corrosion resistant materials such as copolymer polypropylene, Super Proline PVDF and Halar® (ECTFE).

Fluids can be pumped through the carrier pipe up to 150psi.

Leak detection cable can be easily installed in sizes 3x6 and higher.

## Duo-Pro® Ideal Applications

- **Drainage applications**
- **Pressurized transfer lines**
- **Manufacturing**
- **Underground installations**

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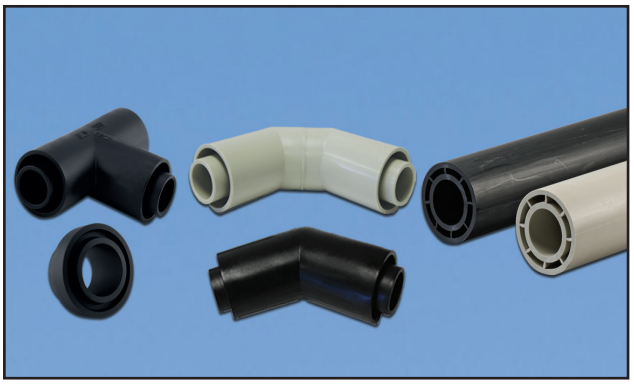
## Poly-Flo® - PP, Advanced PE

Poly-Flo's® unique unitary construction saves time and labor on each project. Low cost and easy installation makes Poly-Flo® the ideal system for drainage systems, pressurized transfer lines and industrial applications needing up to 4" carrier pipe.

Typical Poly-Flo® installations include water and wastewater treatment applications using sulfuric acid, caustic soda and sodium hypochlorite; and chemical processing and semiconductor applications handling sodium hydroxide, aluminum nitrate, and sulfuric and hydroflouric acid.



## Supply Range

**Standard Sizes:** 1x1-1/2 (32x50mm), 2x3 (63x90mm) and 4x6 (110x160mm)
**Materials:** Proline® PP-R, Chem Proline® PE

**Welding Methods:**
Simultaneous butt fusion

## Features and Benefits

- Unique co-extruded and molded system. In other double containment pipe systems, the inner and outer components are made separately and then assembled into a double wall configuration.
- The carrier and containment pipe have OD consistent with metric dimensions.
- Assembled using simultaneous butt fusion only.
- Available with manual and low point leak detection sensors only.

## Sample Specification

System shall be Asahi/America's newly reengineered Poly-Flo® PP and HDPE co-extruded double containment pipe. System shall meet the pressure and materials requirements of the specifications. Poly-Flo® co-extruded pipe has a carrier pipe rating of SDR11 rated for 150psi at 68°F, and containment pipe rating of SDR17 rated for 90psi at 68°F.

Please consult Asahi/America for expanded product sample specification.

## Why Choose Poly-Flo®?

Poly-Flo® pipe and fittings are stocked in our Massachusetts warehouse, which reduces lead times when compared to other double containment piping systems.

Poly-Flo's® smaller profile dimensions are ideally suited for installations that possess tighter space constraints such as chemical rooms.

Poly-Flo® is self-restraining making it ideal for horizontal directional drilling (HDD).

### Poly-Flo® Ideal Applications

- **Horizontal directional drilling**
- **Applications where there are fluctuations in temperature**
- **Installations with tight space constraints**
- **Chemical piping**

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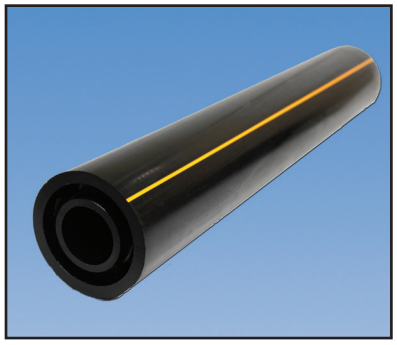
## Chem Prolok® - Advanced PE

Chem Prolok® is a revolutionary double wall piping system offered in either Chem Proline® x PE100 or Chem Proline® x Chem Proline®. PE's chemical compatibility is resistant to crack propagation, and the fused system eliminates the need for cement and thread. Chem Prolok® is also highly resistant to sunlight, which allows for above ground installations. Stocking sizes 1x3 through 12x16.



Certified to NSF/ANSI 61-G

## Supply Range

**Standard Sizes:** 1x3 through 12x16

**Materials:** Chem Proline® PE x PE100, Chem Proline® PE x Chem Proline® PE

**Welding Methods:**
Socket fusion, butt fusion, electrofusion

## Features and Benefits

- Superior stress cracking and abrasion resistance.
- High creep rupture strength.
- High pressure load resistance at 150psi at 72°F.
- Wide temperature range (between -40°F - 140°F).
- Exceptional weldability.
- High resistance to chemical attack.
- High impact resistance and ductility.

## Sample Specification

Chem Prolok® D/C pipe and fittings shall be made of black polyethylene (PE) resin with a cell classification of PE445584C and shall conform to the material requirements according to PAS 1075. Primary pipe shall be SDR rated to 150psi at 72°F. Secondary pipe shall be SDR 11 rated to ≤150psi or 33 rated to 45psi at 72°F. System shall be joined by socket fusion, butt fusion and/or electrofusion.

Please consult Asahi/America for expanded product sample specification.

## Why Choose Chem Prolok®?

Chem Prolock® posses excellent chemical resistance.

Its UV resistance minimizes the need for a protective covering.

Pressure rated to 150psi, Chem Prolok® resists stress cracking and is abrasion resistant.

Ideal for above or below ground installation.

Chem Prolok® is NSF 61-G certified.

Leak detection cables can be installed in sizes 3x6 and higher.

## Chem Prolok® Ideal Applications

- **pH range 1-14**
- **Bleach (sodium hypochlorite)**
- **Process chemical and waste**
- **Caustic**
- **Acids**
- **Industrial water**
- **Horizontal directional drilling**

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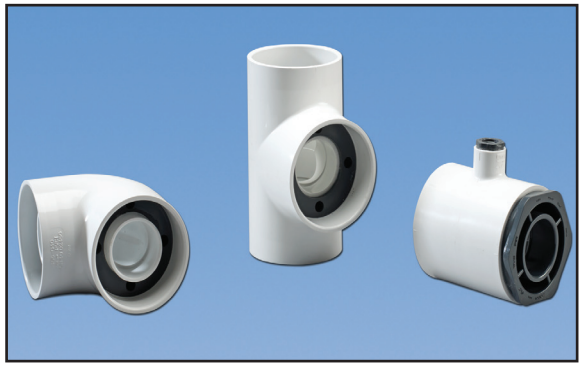
# Pro-Lock® - PVC, CPVC

Pro-Lock® systems combine engineering design with cost effective materials. The result is a reliable double contained piping system for a variety of applications. Pro-Lock® exceeds the requirements of EPA Standard 40 CFR, Part 280 & 281 for underground transport of hazardous chemicals.



## Supply Range

**Standard Sizes:** 1/2x2 through 4x8
**Materials:** PVC, CPVC
Clear PVC also available

**Welding Methods:**
Simultaneous or staggered solvent cement joint

## Features and Benefits

- Easy installation using standard PVC/CPVC equipment and techniques.
- Optional clear containment PVC allows for visual leak detection indication.
- Fittings provided as a “locked” double contained fitting, minimizing field labor.
- Dogbones® provide the option for a compartmentalized system (solid Dogbones®), or a restrained system (restraint Dogbone®).
- Double contained valve tees remain fully pressure rated.

## Sample Specification

System shall be a fabricated double-contained piping system containing PVC and/or CPVC and use simultaneous cemented fittings, which are supplied pre-assembled with support discs welded in place ready for simultaneous cementing in the field. Pipe is supplied pre-assembled with spider clips. Clear PVC pipe for containment can be specified when visual indication of primary pipe failure is desired. Other leak detection options include low-point stations for probe system.

Please consult Asahi/America for expanded product sample specification.

## Why Choose Pro-Lock®?

Pro-Lock’s® design consists of a centralizing support disk inside the containment pipe and fitting, which minimizes carrier pipe deflection, and extends the system’s life. Fittings are made of the same resin as the pipe and are available in a variety of configurations for pressure applications. Fittings are supplied from the factory dual contained and locked together, ready for installation.

Pro-Lock® is assembled in the field using staggered or simultaneous joining methods. Joining cements are recommended based on your application. Pro-Lock® fittings and pipe are NSF-61 certified and IAPMO approved.

## Pro-Lock® Ideal Applications

- **Water treatment**
- **Wastewater treatment**

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## Fluid-Lok® - HDPE

Fluid-Lok® HDPE double containment piping system is available in high density polyethylene and has the widest variety of sizes and wall thickness options. Fluid-Lok® provides a cost-effective piping material with sound engineering design to create a reliable HDPE double wall system for environmental protection. The system is designed around centralizing the carrier pipe inside the containment pipe and locking the two components together. Once inner and outer pipe and fittings are fabricated and locked together, all field welds are performed as in a single wall piping system; inner and outer welds are joined reliably at the same time.

## Supply Range

**Standard Sizes:** 1x3 though 24x32
**Materials:** PE 4710, PE 3608

**Welding Methods:**
Simultaneous butt fusion

## Features and Benefits

- Homogenous material inside and out, providing equal chemical resistance on the carrier and containment pipe.
- Many leak detection options. Systems can be provided with continuous leak detection cable, low-point sensors, or manual observation ports.
- Custom components can also be supplied for each specific project including:
  - Thermoplastic manholes
  - Double contained valve boxes
  - Observation ports
  - Double contained tanks
  - Custom fittings and assemblies

## Sample Specification

System shall be a double containment piping system produced with high density polyethylene on both the product and containment pipe and shall provide the ability to incorporate leak detection as specified. Access tees, pull ropes and low-point instrumentation taps shall be provided as specified by leak detection specifications or contract drawings.

Please consult Asahi/America for expanded product sample specification.

## Why Choose Fluid-Lok®?

Available in various SDR combinations to allow cost savings when high pressures are not required (sizes 3x6 and up).

Domestically made HDPE 4710/3608 conforming with Buy American Act requirements.

## Fluid-Lok® Ideal Applications

- **Landfill**
- **Ground water remediation**
- **Mining slurry**

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# Leak Detection

## Leak Detection Basics

The Environmental Protection Agency (EPA) has directed underground transport of hazardous materials be protected from release into the environment in its Standard 40 CFR, Part 280.42, 298.44 and 281.33. Our Duo-Pro®, Poly-Flo®, Fluid-Lok®, Pro-Lock® and Chem Prolok® systems have been specifically engineered to exceed the piping system requirements of the EPA.

A basic leak detection decision-making matrix should include:

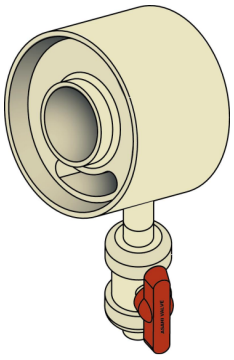
- What EPA requirements, if any, apply?
- Is the system pressurized or drainage?
- Will the system be buried?
- If buried, is it under concrete or other difficult-to-access locations?
- Is the media transported over work stations/areas (safety concerns)?
- What are the potential safety hazards associated with media exposure?
- How important is location of the leak in terms of costs of potential repair?
- Is manual leak detection possible?

## Manual Leak Detection

Manual leak detection for drainage applications is the simplest of the three available methods. It is accomplished by accessing the annular space, generally at low points in a system, with a valve, plug, or pipe riser to grade. The EPA mandates a leak detection process that involves the periodic manual inspection of the ports at least every 30 days.

## Manual Leak Detection Features and Benefits

- Simplified system engineering.
- Cost effective installation.
- Locates leaks within a zone or sector of a system.
- Can be used with Duo-Pro®, Poly-Flo®, Fluid-Lok®,Pro-Lock® or Chem Prolok® systems.

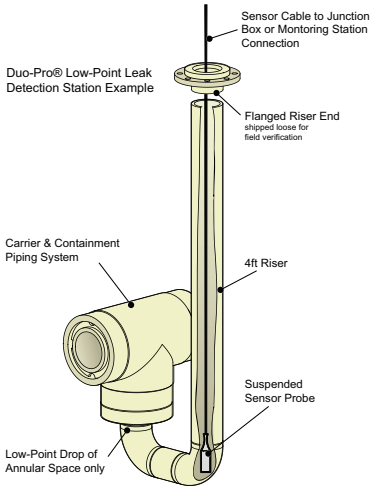


## Electronic Low-Point Leak Detection

Low-point leak detection is similar to manual leak detection, but utilizes electronic sensors in the place of manual valves or plugs. A wide variety of low-point sensors are available with varying functionality. Selection of sensor type is often dependent upon transported media. The two most common sensors are conductivity probes and float switch adapters.

## Electronic Low-Point Leak Detection Features and Benefits

- Cost effective installation.
- Simplified system engineering.
- Automated detection process for buried applications.
- Locates leaks within a zone or sector of a system.
- Probe panel is generally tied-in at a central alarm location.
- Can be used with Duo-Pro®, Poly-Flo®, Fluid-Lok®, Pro-Lock® or Chem Prolok® systems.

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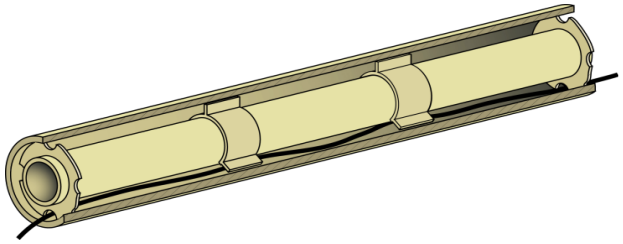
# Leak Detection

## Continuous Leak Detection Cable

Continuous leak detection sensing cable offers the most accurate method of leak detection. Sensor cable systems are capable of locating multiple leaks without loss of accuracy and sensitivity. Leak locations can be determined to within five feet of the source. Sensor cables utilize time domain reflectometry technology as the basis of leak detection. The technology operates similar to radar. Thousands of times each minute, safe energy pulses are sent out on the sensor cables. As these energy pulses travel down the cable, reflections are returned to the monitoring unit and a map of the reflected energy from the cable is stored in memory. The presence of liquids on the sensor cable, in sufficient quantities to "wet" the cable, will alter its electrical properties. This alteration will cause a change in the reflection at that location. The alteration is then used to determine the location of a leak.



## Continuous Leak Detection Cable Features and Benefits

- Requires engineered location of access ports.
- Requires sufficient annular space for pulling of cable; not compatible with Poly-Flo® systems.
- Precise automated detection ideal for buried applications.
- Locates leaks within five feet of source.
- Can be used with Duo-Pro®, Fluid-Lok® and certain Pro-Lock® and Chem Prolok® systems.

## LiquidWatch™ Probe Systems

LiquidWatch™ monitoring units have been engineered to meet a broad range of customer needs. The LiquidWatch™ panel is modular by design and can be configured with up to 64 probes and 16 alarm relays. The modular design allows for meeting current needs while allowing for future expansion of the system.

The standard panel is supplied with a monitoring capacity of up to eight discreet probes. Additional probe monitoring requirements are met by the addition of single or multiple expansion cards capable of monitoring up to eight additional probes each.

## LiquidWatch™ Features and Benefits

- Sensing of organic liquid (hydrocarbons and solvents) or water within seconds of contact.
- Vapor or gases are ignored.
- Remote monitoring capability with an RS-232 interface and relays.
- NEMA 4X enclosure.
- Up to 64 probes and 16 programmable alarm relays.
- Optional UL Listed with Class 1, Division 1, Group C & D sensor circuits.

## Pal-At™ Leak Detection/Location Monitoring Units

Pal-At™ monitoring systems are microprocessor-based units capable of the continuous monitoring of a sensor string for leaks, breaks and shorts. The units have sensing ranges of 3,000 to 7,500 feet per cable with up to four cables per panel. The alarm unit operates on the principle of pulsed energy reflection and maps the entire length of the sensor cable. A digitalized system map is stored in nonvolatile memory. Alarm panels provide continuous indication that the sensor cable is being monitored.

## Pal-At™ Features and Benefits

- Can locate multiple leaks without loss of accuracy or sensitivity.
- Can differentiate between breaks and shorts versus a wetted cable.
- Archives information with time and date.
- RS-232 serial port communications.
- Accepts both probes and cable sensors in one sensor string.
- One cable for all liquids or multiple cables for differentiation of hydrocarbon leaks
- AT30K monitors up to four separate cable strings.

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# Design and Installation

## Overview

Double containment piping systems were initially designed and installed in the late 1970s for the chemical and petroleum industries. The movement from strictly single wall piping systems to double contained evolved over time due to concerns for plant personnel safety and better prevention of leaks entering the ground soil environment. At that time, installation usually required tremendous imagination and field fabrication by the site contractor, including the need to cut the outer containment fitting in half to install the carrier fitting. Depending on the materials of construction, the contractor would have to weld, glue and wrap the containment fitting back together after the carrier fitting was positioned inside the containment fitting.

Although advances were being made and intentions were good, many of these early containment piping system efforts met with limited success; some didn't pass initial carrier and containment pipe pressure testing. These limited successes pushed pipe manufacturers to engineer systems requiring less job site cutting and fabrication of containment fittings. In the mid-1980s, the federal government's Environmental Protection Agency (EPA) began to look more closely at underground petroleum storage tanks and associated underground pipe. The EPA concluded that these systems were prone to failure and would need to be addressed.

Hazardous leaks from single wall tanks and pipe were common, but not all alike. A spill that releases toxic chemicals into the environment is called a toxic release and is measured in pounds of chemical discharge. There are two types of toxic release: on-site and off-site.

On-site releases occur at the facility and are categorized as air emissions, discharges to surface water, underground injections, or releases to land.

Off-site releases occur when chemicals are transferred to other facilities for disposal, treatment or recycling.

In 1986, the EPA, in response to failing and leaking pipings systems and tanks, passed legislation requiring corrosion resistant underground double containment tanks and associated underground pressurized piping to employ electronic leak detection when storing or transferring hazardous liquid. Similar regulations for drainage piping were passed, but did not require electronic leak detection. These regulations are 1040 CFR 280 and 281; part of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and the Resource Conservation and Recovery Act (RCRA).


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# Special Considerations

## When to Use Double Containment Piping

### Underground EPA Requirements

The US Environmental Protection Agency (EPA) has adopted regulations on underground storage tanks (USTs) and related piping. The EPA states that these systems pose threats to the environment. EPA regulation 40 CFR 280 spells out the minimum requirements for USTs that contain petroleum or hazardous chemicals.

A summary of the EPA's requirements that affect double containment piping follows. This is a brief overview. A project engineer needs a thorough understanding of the regulations prior to designing a system.

**EPA's Regulations Cover:**
**Media:** All listed under 42 U.S.C. 9601 (14).

**Systems:** All USTs and related piping.

**System requirements:** All USTs and pipes must be installed so that a release from the product pipe is contained or diverted to a proper collection system. Containment may be done via a trench, dike, or double containment pipe and tanks. The containment materials must be able to hold the leaking product for a minimum of 30 days. By then, scheduled inspections and periodic monitoring should identify the failure and correct the situation.

**Leak detection:** Drainage and suction lines require monthly manual inspections for product line leaks. Pressurized systems require automatic monitoring for product failure. In case of a leak, the system must automatically restrict flow of the product.

**Compliance dates:** The EPA has set requirements for the date of compliance for both new and existing systems. Contact Asahi/America for the latest standard, or visit the EPA's web site at www.epa.org.

**Above ground:** In addition to the EPA requirements for below grade systems, many companies have adopted policies for overhead piping to protect personnel from a possible leak of a harmful chemical.

## Design of the Double Containment Piping System

### Installation System

In comparison with the installation of a single pipe, there are possible changes in length in the installation of the double containment piping system that are due to thermal expansion or contraction, and they require special attention. The temperature changes of the inside and outside pipes can be different or even opposite based on the distance between the pipes. This can lead to considerable length expansions between the pipes. If it cannot be detected, constructive stress will develop, which is an additional demand on the pipe lines. There are two available systems to alleviate stress: a fixed system and an unimpeded heat expansion system.

### Fixed System

The inside, outside, and surrounding areas of the pipe are fixed together by Dogbones® at each pipe direction change. A length expansion of the inside or outside pipe is not possible.

Advantages:
- Low expenses
- Little area needed

Disadvantages:
- High Dogbone® forces (note the fixing demand)

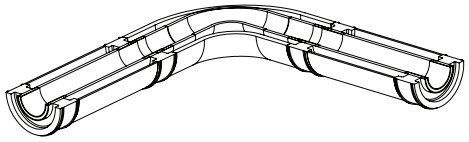

**Figure F-8. Fixed system design**

### Unimpeded Heat Expansion (Flexible System)

The inside and outside pipes are installed so that a length expansion from both pipes, and even among each other, can happen. In terms of the planning, it needs to be considered that the length expansion of the inside pipe takes place in the outside pipe.

Advantages:
- Applicable for higher operating temperatures
- Low stress of the double containment piping system because of free expansion

Disadvantages:
- Higher expenses
- Often need large area because of the compensation elbow

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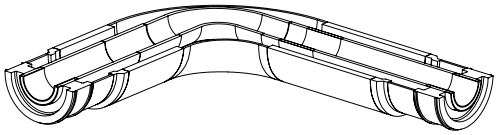

**Figure F-9. Unimpeded heat expansion design**

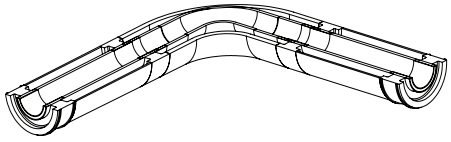

**Figure F-10. Impeded heat expansion design**

## Specialty Fittings

Double containment systems, for the most part, can be thought of in the same manner as single wall piping systems, with a few exceptions. In a double wall system, the issue of thermal expansion is more complicated and the outer containment pipe must have a start and stop. The fitting that sets Asahi/America systems apart from other double wall systems is our patented Dogbone® force transfer fitting. The Dogbone® fitting can be used in many ways to assist in the design of a proper double containment piping system.

The Dogbone® is used for:

- Locking the inner and outer pipes together
- Compartmentalizing pipe section
- Termination of the containment pipe
- Sensor installation
- Control of thermal expansion

Figures G-8 through G-11 depict a few uses of the Dogbone®.

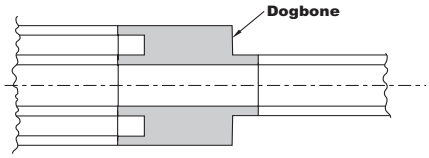


**Figure G-8. Outer containment termination**

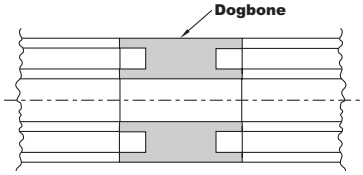


**Figure G-9. Locking inner and outer pipes**

Dogbones® are available in solid and annular forms. A solid Dogbone® does not allow fluid to pass through the annular space, while annular Dogbones® will allow the passage. The placement and purpose of the fitting will determine the style required. Dogbone® fittings are available in Duo-Pro®, Fluid-Lok® and Poly-Flo®.
The Dogbone® can be used for connecting low-point leak detectors, ventilation, and drainage. When designing a double wall system, it is important to incorporate high point vents to eliminate air from the system. In the event of a leak, a drainage method for the containment pipe is required. Connection methods for these valve requirements are shown in figures G-10 through G-13.

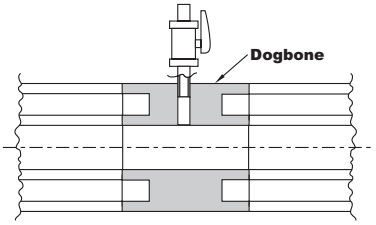


**Figure G-10. Ventilation of inner pipe: Duo-Pro® and Fluid-Lok®**

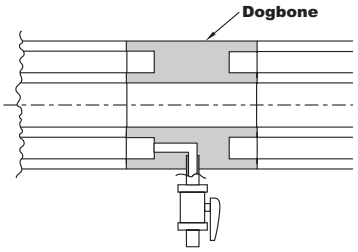


**Figure G-11. Containment Pipe: Duo-Pro® and Fluid-Lok®**

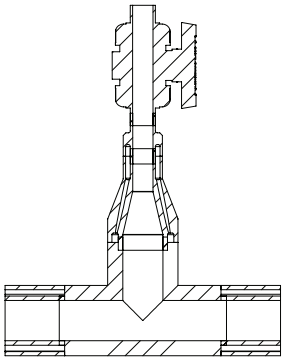

**Figure G-12. Ventilation of inner pipe: Poly-Flo® system**

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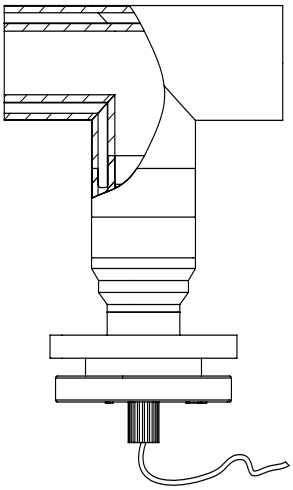

**Figure G-13. Drainage of containment pipe: Poly-Flo® system with low point sensor**

## Double Contained Valves

In pressurized systems, the necessity of valves can be accomplished without interrupting the integrity of the double containment system. Double contained valves are available in many shapes and forms; they are also available in any style valve such as ball, butterfly, diaphragm, check, and gate. The valve selected, based on the application, determines the shape of the outer containment.

The following figure demonstrates a valve configuration available from Asahi/America. Other options are readily available on request.

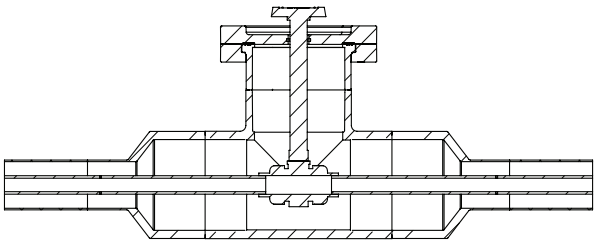

**Figure G-14. Double contained ball valve with stem extensions**

## Thermal Expansion

Based on your operating criteria, thermal expansion may need to be considered. For systems maintained at consistent temperatures, compensation for thermal effects may not be required. In a double contained piping system, three types of expansion can occur:

- The carrier pipe is exposed to thermal changes, while the containment remains constant. This is typically possible when the carrier pipe is exposed to liquids of various temperatures, while the outer containment is in a constant environment, such as in buried applications.
- The containment piping experiences thermal changes, while the carrier remains constant. The typical application is outdoor pipe racking with constant temperature media being transported in the carrier.
- Both inner and outer pipes experience temperature change.

The Dogbone® fitting is a proven and effective way to control thermal expansion where a restrained system is acceptable. It can also be used to direct the growth of a flexible system. However, it is important to review all aspects of the operating environment, such as:

- Is it outdoors where it will be exposed to changing weather?
- Is the system spiked with a high temperature cleaning solution?
- Will the system run at a significantly higher or lower temperature than the installation temperature? The occurrence of any thermal change in a plastic system will cause the material to expand or contract.

Thermoplastic systems can be used in hot applications and applications where the temperature is cyclical; it just requires analysis of the thermal expansion effects. In most cases, the use of expansions, offsets, and proper hanging techniques is all that is required to ensure a proper design.

Hot systems also reduce the rigidity of thermoplastic piping, which, in turn, decreases the support spacing between hangers. In smaller dimensions, it is recommended to use continuous supports made of some type of channel or split plastic pipe. The use of hangers as guides and anchors becomes important. Certain hangers should be used as guides to allow the pipe to move in-line, while other hangers should be anchoring locations used to direct the expansion into the compensating device.

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# Special Considerations

The anchors and hangers should be designed to withstand the thermal end-load. In a buried system, the standard Dogbone® fitting will lock the inner and outer pipes together. The surrounding ground and fill should eliminate the movement of the outer pipe.

In systems that are hung, the outer pipe hanger must withstand the thermal end-load. To properly hang these systems, a special restraint Dogbone® is recommended at the hanger locations.

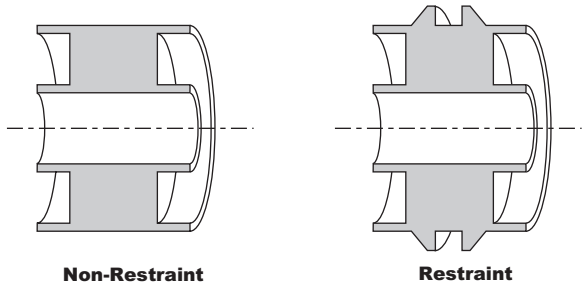



**Figure G-17. Dogbone®**

## Hanging

As in any thermoplastic system, the selection of hangers is an important decision. Hangers that scratch or create point loads on the pipe are not recommended. The ideal hanger is a thermoplastic component. In many cases, an all-plastic hanger may not be available. In these cases, a metal hanger is acceptable, but precautions should be taken. Any sharp edges on the hanger should be removed. A cushion made of rubber is recommended in the event that the pipe shifts because it will prevent scratching.

## Burial

Due to EPA requirements, the burial of double containment piping is a common practice. In most cases, the burial of a double wall pipe is the same as that of a single wall pipe system. Careful consideration of the soil type, compaction, trench detailing, back fill, and load is necessary when considering the proper design.

## UV Exposure and Weatherability

All thermoplastic materials react to the exposure of UV differently. PVDF and ECTFE materials are completely UV resistant over the course of their design life. However, certain chemicals containing Cl anions exposed to UV light can create a free radical Cl that will attack the PVDF pipe wall.

Polypropylene is not UV stable. In direct exposure to sunlight, it will break down. The effect can be seen in a noticeable color change in the pipe. In pigmented PP systems, the color change will create a protective shield on the outer layer of the pipe and prevent further degradation. For PP pipes with a wall thickness greater than 1/4", the effect of UV is normally reduced and can be used outside. However, it is still recommended to protect it from UV exposure for added safety.

The Fluid-Lok®, Poly-Flo® PE and Chem Prolok® HDPE are UV stabilized. Fittings and pipes contain carbon black to make the material UV stable and acceptable for use in outdoor applications. Be sure to consult the manufacturer prior to selecting a pipe system.

## Welding Methods

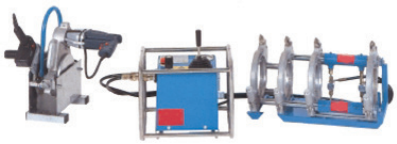
All double containment systems offered by Asahi/America (except Pro-Lock®) are available for butt fusion assembly. Butt fusion provides reliable fusion, and is well-suited for double wall systems. By properly aligning the carrier and containment piping with the support disc, both the inner and outer pipe can be welded at the same time. This reduces the assembly time, as well as the need for extra fittings such as couplings. What can be accomplished in one weld can take up to four welds in other systems which require welding the inner and outer pipes separately on either side of a coupling.

When building a system that is made of dissimilar materials (example: PVDF x Pro 45), the pipes cannot be welded simultaneously due to different heat and joining force requirements. For these systems, staggered welding, where the inner pipe is welded first and the outer pipe is welded second using a special annular heating element, is required. Staggered fusion does take more time due to the extra welds, but still proves economical when compared to using like materials such as PVDF on both the carrier and containment pipe, depending on pipe size, project requirements, and installation environment.

## Chemical Resistance

Please consult America/America's Engineering Department for information regarding specific chemical resistance questions.

# Field Welding Equipment



**Field 6 (W4400)** - Butt fusion tool available for 50 - 160mm (1-1/2” - 6”) welds.

**Field 12 (W4900)** - Butt fusion tool for 90 - 315mm (3” - 12”) welds.

**Field 20 (W5500)** - Butt fusion tool for 200 - 500mm (8” - 20”) welds.

# Shop Equipment

**Shop 4 Miniplast®** - For socket fusion welding of components from 20 - 110mm (1/2” - 4”).

**Shop 12** - Bench-style butt fusion tool for 50 - 315mm (1-1/2” - 12”) PP, PE and PVDF welding.

# Welding Equipment Selection Charts

### Simultaneous Welding

| | Pro 150 x 150 | Pro 150 x 45 | Pro 45 x 45 | PVDF x PVDF | HDPE SDR 11 x 11 | HDPE SDR 11 x 17 | HDPE SDR 17 x17 |
|---|---|---|---|---|---|---|---|
| Shop 4 Miniplast® | 1 x 3 A | 1 x 3 A | 1 x 3 A | 1 x 3 A | 1 x 3 A | 1 x 3 A | 1 x 3 A |
| | 2 x 4 A | - | - | 2 x 4 A | 2 x 4 A | 2 x 4 A | 2 x 4 A |
| Shop 12 | 2 x 4 A | 2 x 4 A | 2 x 4 A | 2 x 4 A | 2 x 4 A | 2 x 4 A | 2 x 4 A |
| | 3 x 6 A | 3 x 6 A | 3 x 6 A | 3 x 6 A | 3 x 6 A | 3 x 6 A | 3 x 6 A |
| | 4 x 8 B | 4 x 8 B | 4 x 8 B | 4 x 8 B | 4 x 8 B | 4 x 8 B | 4 x 8 B |
| | 6 x 10 X | 6 x 10 B | 6 x 10 B | 6 x 10 B | 6 x 10 X | 6 x 10 X | 6 x 10 X |
| Field 6 | 2 x 4 A | 2 x 4 A | 2 x 4 A | 2 x 4 A | 2 x 4 A | 2 x 4 A | 2 x 4 A |
| | 3 x 6 A | 3 x 6 A | 3 x 6 A | 3 x 6 A | 3 x 6 A | 3 x 6 A | 3 x 6 A |
| Field 12 | 3 x 6 A | 3 x 6 A | 3 x 6 A | 3 x 6 A | 3 x 6 A | 3 x 6 A | 3 x 6 A |
| | 4 x 8 A | 4 x 8 A | 4 x 8 A | 4 x 8 A | 4 x 8 A | 4 x 8 A | 4 x 8 A |
| | 6 x 10 A | 6 x 10 A | 6 x 10 A | 6 x 10 A | 6 x 10 A | 6 x 10 A | 6 x 10 A |
| | 8 x 12 B | 8 x 12 A | 8 x 12 B | - | 8 x 12 B | 8 x 12 B | 8 x 12 B |
| Field 20 | 4 x 8 B | 4 x 8 B | 4 x 8 B | - | 4 x 8 B | 4 x 8 B | 4 x 8 B |
| | 6 x 10 A | 6 x 10 A | 6 x 10 A | - | 6 x 10 A | 6 x 10 A | 6 x 10 A |
| | 8 x 12 A | 8 x 12 A | 8 x 12 A | - | 8 x 12 A | 8 x 12 A | 8 x 12 A |
| | 10 x 14 A | 10 x 14 A | 10 x 14 A | - | 10 x 14 A | 10 x 14 A | 10 x 14 A |
| | 12 x 18 A | 12 x 18 A | 12 x 18 A | - | 12 x 18 A | 12 x 18 A | 12 x 18 A |
| | - | 14 x 18 A | 14 x 18 A | - | - | 14 x 18 A | 14 x 18 A |
| | - | 16 x 20 A | 16 x 20 A | - | - | 16 x 20 A | 16 x 20 A |

### Staggered Welding

| | Shop Conditions | | | | Field Conditions | | | |
|---|---|---|---|---|---|---|---|---|
| Size | Minplast® | Maxiplast® | Shop 12 | Trench 12 | Miniplast® | Maxplast® | Shop 12 | Trench 12 |
| 1 x 3 | A | - | - | - | A | - | - | - |
| 2 x 4 | A | A | A | - | A | A | B | - |
| 3 x 6 | - | A | A | A | - | A | B | A |
| 4 x 8 | - | - | A | A | - | - | B | A |
| 6 x 10 | - | - | A | A | - | - | B | A |
| 8 x 12 | - | - | A | A | - | - | B | A |

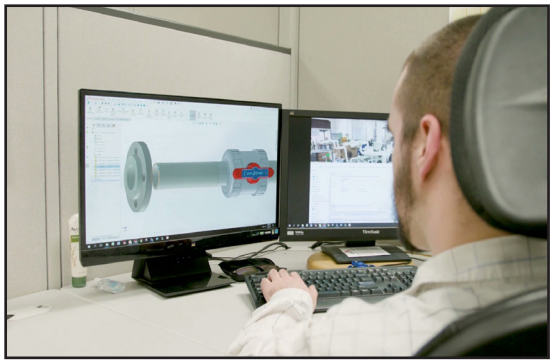
A= Recommended

B = Will work but better choices are available

X = Not available

## Engineering Support Service

Asahi/America provides fully customized assemblies, tanks and fittings to support the most demanding customer needs. Our thermoplastic experts can assist in up-front design or post-design manufacturing. From micro-machining to mega-assemblies, Asahi/America is poised to help solve your corrosion problem.

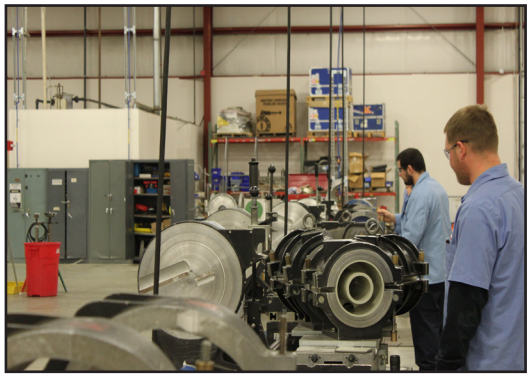



**Support**
- Staff engineers for design analysis
- Industry leading turnaround time
- On site start up training

**Services**
- Prefabrication of spool pieces
- Precision plastics machining
- System design and development

## Fabrication and Specialty Products

Asahi/America's team of craftsmen are poised to create custom pipe spools, fittings and accessories in a wide range of corrosion resistant thermoplastic materials. Supported by our application engineers and CAD design professionals our trained experienced staff is able to create custom pieces to meet your applications requirements.

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## Chem Proline® by Asahi/America (Advanced PE)

**Pipe and Fittings**
- 20 - 315mm (1/2" - 12") SDR 11, 150psi

**Valves**
- Type-21 ball valves: 20 - 110mm (1/2" - 4")
- Type-57P butterfly valves: 50 - 315mm (1-1/2" - 12")
- Type-14 diaphragm valves: 20 - 250mm (1/2" - 10")
- Ball check valves: 20 - 110mm (1/2" - 4")

**Welding**
- Butt, socket, electrofusion

**NSF-61-G Approved**

NSF Certified to NSF/ANSI 61-G

## Proline® (PP)

**Pipe and Fittings**
- 20 - 500mm (1/2" - 20") SDR 11, 150psi
- 110 - 1200mm (4" - 48") SDR 33, 45psi

(Other sizes and SDRs available up to 1400 (55")

**Valves**
- Type-21 ball valves: 20 - 110mm (1/2" - 4")
- Type-57P butterfly valves: 50 - 1400mm (1-1/2" - 55")
- Type-14/15/G diaphragm valves: 20 - 200mm (1/2" - 10")
- Ball check valves: 20 - 110mm (1/2" - 4")
- Frank series regulating valves: 20 - 110mm (1/2" - 4")

**Welding**
- Butt, socket, electrofusion

**NSF-61-G Approved**

NSF Certified to NSF/ANSI 61-G

## Ultra Proline® (ECTFE/Halar®)

**Pipe and Fittings**
- 20 - 110mm (1/2" - 4") SDR 21, 150psi

**Valves**
- Ball valves: 20 - 32mm (1/2" - 1")
- T-342 diaphragm valves: 20 - 63mm (1/2" - 2")
- Frank series regulating valves: 20 - 63mm (1/2" - 2")

**Welding**
- Butt

## Super Proline® (PVDF)

**Pipe and Fittings**
- 20 - 315mm (1/2" - 12") SDR 21, 230psi
- 90 - 400mm (3" - 16") SDR 33, 150psi

**Valves**
- Type-21 ball valves: 20 - 110mm (1/2" - 4")
- Type-57P butterfly valves: 50 - 315mm (1-1/2" - 12")
- Type-14 diaphragm valves: 20 - 63mm (1/2" - 4")
- Ball check valves: 20 - 110mm (1/2" - 4")
- Frank series regulating valves: 20 - 75mm (1/2" - 2-1/2")

**Welding**
- Butt, socket

## Air-Pro® Compressed Air Piping

**Pipe and Fittings**
- 20 - 110mm (1/2" - 4") SDR 7.4, 230psi
- 160 - 315mm (6" - 12") SDR 11, 160psi

**Valves**
- Ball valves: 20 - 63mm (1/2" - 2")

**Welding**
- Butt, socket, electrofusion

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