	PLASTIC GAS DISTRIBUTION SYSTEM CONSTRUCTION AND MAINTENANCE		A-93.1
	Asset Type: Gas Distribution	Function: Construction and Maintenance	
Issued by: M. G. Rossi	Original Signed By	Date: 04-03-09	
Rev. #08: This document replaces Revision #07. For a description of the changes, see Page 12.			

This document also appears in the following manual:

- [Gas Applicant Design Manual](#)

Purpose and Scope

This numbered document provides construction and maintenance information for a PE pipe and tubing gas distribution system.

Acronyms

- BS: branching saddle
- CTS: copper tubing size
- DCD: DCD Design & Manufacturing Ltd.
- EMS: electronic marker system
- HDD: horizontal directional drilling
- HDPE: high-density polyethylene
- IPS: iron pipe size
- MDPE: medium-density polyethylene
- OD: outside diameter
- PE: polyethylene
- psig: pounds per square inch gauge
- PVC: polyvinyl chloride
- QC/S: qualified contractor/subcontractor
- SDR: standard dimensional ratio
- WT: wall thickness

References

Document

Plastic Gas Lines on Bridge Structures	A-33.1
Piping Design and Test Requirements	A-34
Procedures for Purging Gas Facilities	A-38
Prepurging Procedure for 2" Plastic Pipe	A-38.2
Casing for Highway Crossings	A-70
Gas Service and Mains in Plastic Casing	A-75
Plastic Main and Service Installation	A-90
Polyethylene Pipe Specifications and Design Considerations	A-93
Excess Flow Valves	A-93.3
Skinner Leak Repair Clamps	B-53
Repair Clamps	B-53.1
Compression Couplings	B-54
Plastic System Socket and Butt Fusion Fittings	B-90
Plastic System Saddle Fittings	B-90.1
Plastic System Accessories	B-90.2

References, continued

Document

Electrofusion Fittings and Tapping Tees	B-90.3
Mechanical Transition Fittings for Plastic Systems	B-91
Plastic System Mechanical Fittings	B-91.1
Cast Iron to Steel Insulated Transition Couplings	B-91.4
Cast Iron to Polyethylene Transition Fittings	B-91.5
Qualifications for Joining Plastic Pipe	D-34
Squeezers for PE Pipe	M-12.1
Static Grounding Accessories for PE Pipe	M-14.1
Approved Specialty Locating Instruments	M-62
Grounding Polyethylene Pipe to Control Static Electricity	Utility Work Procedure WP4170-01
Squeezing Polyethylene Pipe	Utility Work Procedure WP4170-02
Polyethylene Heat Iron Socket Fusion	Utility Work Procedure WP4170-04
Polyethylene Heat Iron Saddle Fusion	Utility Work Procedure WP4170-05
Polyethylene Heat Iron Butt Fusion	Utility Work Procedure WP4170-06
Polyethylene Electrofusion Coupling and Saddle Connections	Utility Work Procedure WP4170-07
Polyethylene Mechanical Fitting Connections	Utility Work Procedure WP4170-08
Specifications for Furnishing and Delivery of Polyethylene (PE) Plastic Tubing	EMS 2502
Specifications for Furnishing and Delivery of Polyethylene (PE) Plastic Piping	EMS 2503
Horizontal Directional Drilling Manual	

General Information

Employees involved in the installation of PE pipe shall be instructed, trained, and qualified to use the approved equipment and installation procedures associated with PE pipe. PE pipe and fittings shall be joined by qualified employees using approved heat-fusion or electrofusion joining procedures (see Utility Work Procedures [WP4170-04](#), [WP4170-05](#), [WP4170-06](#), [WP4170-07](#), and [WP4170-08](#)), or using mechanical fittings.

Handling

1. Handle PE pipe carefully to eliminate the possibility of damage during loading, unloading, and storage operations. During transport, the pipe must be supported to minimize movement and must be located away from any source of heat, such as equipment or vehicle exhaust. It shall be protected against ropes or other securing devices. Chains shall not be used to secure the pipe. Supplies or other equipment shall not be placed on top of the pipe.
2. String coils of plastic pipe by hand or from a reel. Coils of 4" diameter pipe and larger shall be strung from an approved trailer designed for large-diameter, coiled PE pipe (contact the Plastic Hotline at Company phone number 223-9161). Coils should not be rolled over sharp objects or pulled over rough surfaces. String straight lengths by lifting the pipe from the truck to the ground. The pipe should be protected from rocks or other abrasive material during this operation and should not be dropped from a height.



Do not use an open blade knife to cut and remove shrink-wrap from silo packs and bundles.
 Use a film knife or tube knife to remove packing materials.
 Contact the Plastic Hotline at Company phone number 223-9161 for ordering information.

Coiled PE pipe is confined with straps at intervals within the coils. As the pipe is uncoiled, only cut the outside straps. Take precautions to avoid kinking the pipe. Do not uncoil the pipe faster than the straps can be cut.

3. Carefully inspect PE pipe for kinks, gouges, scratches, punctures, and other imperfections after each of the handling operations. PE pipe must be repaired or rejected if defects or damages exceed 10% of the wall thickness of the pipe. Pipe wall thicknesses are listed in [Numbered Document A-93](#).
4. Never weld or cad-weld close to PE pipe without protecting the pipe with a heat-resisting baffle or wet rags. Do not perform welding on pipe connected and immediately adjacent to plastic pipe to minimize the possibility of directing sparks or hot material onto the plastic pipe. See Item 12D on Page 8.

Installation

Verify the print line on the pipe or tubing and document the date of manufacture, the manufacturer's name, and the SDR per Item 30 on Page 12 before installation. Ensure that the pipe or tubing was manufactured at a PG&E-approved plant. See [Attachment B](#) to Numbered Document A-93, for approved manufacturers and plants. Pipe and tubing that is shipped directly from the manufacturer to the job site shall not be older than 6 months, as outlined in [EMS 2502](#) and [EMS 2503](#). Yellow MDPE pipe more than 3 years old must be accompanied by a "[Compressed Ring Test Record](#)" to ensure it has met the requirements of [Numbered Document A-93](#). Black 1/4" HDPE tubing may be stored for 20 years before needing a Compressed Ring Test.

Where existing plastic gas facilities are found to not have a locating wire or where the locating wire is bare, an appropriate EMS device shall be placed in the excavation if other EMS devices do not adequately define this facility. In the course of excavation work by PG&E or others, PG&E shall use the open excavation as an opportunity to install needed EMS devices. EMS devices shall be installed in incidental excavations at angle points, laterals, main dead ends, and at approximately 50-foot intervals over the main, where existing plastic gas facilities are found to not have a locating wire or where the locating wire is bare. These marker units shall be documented with dimensions and appropriately mapped on facility maps using the mapping symbol "EM".

Inserting Plastic Pipe Into a Casing, Bore Hole, or Bridge Structure

5. The following general requirements apply when plastic pipe is installed in any casing. Refer to [Numbered Document A-75](#) for the specific installation requirements for plastic pipe in a plastic casing. Refer to [Numbered Document A-33.1](#) for the specific installation requirements for plastic lines on bridge structures.
 - A. Ensure that the inside diameter of the casing pipe is free of sharp or rough surfaces. All casing pipe must have the ends reamed. Where necessary, the entire length of the casing pipe must be reamed.
 - B. Ensure that the minimum bend radius is not exceeded during insertion into a casing. Table 1 lists the minimum, permissible, bend radius values.

Table 1 Minimum Bend Radius in a Casing for Specified Pipe Sizes

Pipe Size (Inches-CTS)	Minimum Bend Radius – r (Inches)
1/4 CTS	7-1/2
1/2 CTS	12
1 CTS	18
1-1/4 IPS	30

- C. Provide protection from sharp casing edges for main and service inserts (see [Numbered Document A-90](#)). Casing size and other requirements for highway crossings are given in [Numbered Document A-70](#).
- D. Ensure that casing pipe containing a plastic main or service is not subjected to temperatures greater than 140°F. Refer to the additional temperature and installation limitations specified in [Numbered Document A-93](#). During insertion, the leading edge of the plastic pipe or tubing must be sealed.
- E. Plastic pipe is approved for double inserting into existing mains and services. This application is approved provided the following conditions are met:
 - (1) It is not practical or economical to remove the previously inserted pipe.
 - (2) The installation is made in accordance with [Numbered Document A-75](#) or [A-90](#), as applicable, particularly with respect to protecting and supporting the entry and exit points.
 - (3) The installation is mapped according to the provisions in [Utility Standard D-S0457](#), which require that both the casing size and casing material be identified. For example, a 1/2" plastic service inserted into a 1" copper pipe that is inserted into a 2" steel line is mapped as shown in Figure 1 on Page 4.
 - (4) Squeezing of the outer casing shall only be allowed in the case of an emergency. If the outer casing pipe is squeezed, the casing shall be grounded. The PE gas-carrier pipe shall be replaced after flow control is no longer needed.
 - (a) If outer casing is metallic (i.e., steel or copper), ground the casing using a ground cable that is grounded to wet earth.

Hyperlinks Are Inactive
Plastic Gas Distribution System
Construction and Maintenance

- (b) If the outer casing is PE, ground the squeezer and casing as if the casing were the carrier pipe in accordance with the provisions of this numbered document.
- (c) If the casing is PVC or cast iron, remove the casing before squeezing the carrier pipe or tubing, and ground the carrier pipe in accordance with the provisions of this numbered document.

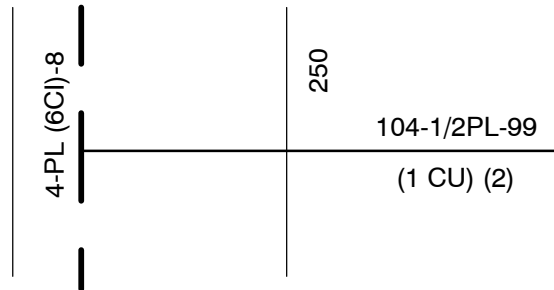


Figure 1
Mapping of a Double Insert

- (5) Take special precautions when accessing the carrier pipe (window cutting) to avoid damaging it. If damaged, the carrier pipe must be replaced per this numbered document.
- (6) If pipelines are installed using technologies where a casing may be required, such as HDD, steel pipe splitting, or cast-iron pipe bursting, it is acceptable to insert plastic pipe and tubing into a new plastic casing if the installation of the new plastic casing meets the following requirements:
 - (a) All the current design requirements as specified in [Numbered Document A-75](#) are satisfied.
 - (b) The newly installed products are mapped correctly. For example, the bursting of a 4" cast-iron main for the placement of a 4" plastic main into a 6" plastic casing is mapped as follows: 4 - PL (6PL).
- (7) Adhere to the requirements for piping cover depth included in Item 7 in the "Direct Burial" section starting on Page 7 of this numbered document.
- (8) PE pipe may be pushed or pulled through a casing or bore hole. Do not pull it through a casing pipe or bore hole with mechanical equipment unless special precautions are taken to eliminate the possibility of overstressing the pipe. Two methods of eliminating the possibility of overstressing include constantly monitoring the pipe or using a pulling head containing a "weak link." During HDD operations, the equipment gauge pressure shall not be used to determine pulling forces on the pipe.

F. 1/4", 1/2", and 1" CTS

Pulling forces shall not exceed the values given in Table 2.

Table 2 Maximum Pulling Force 1" and Smaller

Pipe Diameter (Inches – CTS)	Maximum Pulling Force (Pounds)
1/4 SDR 6	70
1/2 SDR 7	150
1 SDR 11.5	320

G. 1-1/4" IPS and larger

There are two kinds of weak-link systems, as follows:

(1) Pipe Size Differential

A "weak link" consisting of a section of pipe sized two pipe-sizes smaller than the pipe being pulled, and a minimum of 1' in length, can be used to indicate the amount of pulling force being applied. For example, if a 3" diameter pipe is being pulled, a 1-1/4" weak-link section at least 1' in length should be used. Refer to the [Horizontal Directional Drilling Manual](#) for additional details. Pulling forces shall not exceed the values specified in Table 3 on Page 5. Use the weak-link sizes as shown in Table 4 on Page 5.

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Plastic Gas Distribution System
Construction and Maintenance

Table 3 Maximum Pulling Force 1-1/4" and Larger

Product Pipe Diameter (Inches – IPS)	Maximum Pulling Force (Pounds)	PE Tubing/Pipe Size to Use as a Weak Link (Inches)
1-1/4 SDR 10	800	1/2 CTS SDR 7
2 SDR 11	1,500	1 CTS SDR 11.5
3 SDR 11.5	3,100	1-1/4 IPS SDR 10.0
4 SDR 13.5	4,500	2 IPS SDR 11.0
6 SDR 13.5 ¹	9,800	4 IPS SDR 13.5
8 SDR 13.5	16,600	4 IPS SDR 13.5

¹ One exception occurs when pulling 6" SDR 13.5 gas pipe. A 4" SDR 13.5 pipe can be used as a weak link in this instance.

(2) Mechanical Weak Links

The use of mechanical weak links is preferred because the maximum allowable pulling forces may be achieved. Table 4 lists the approximate pulling forces for a given diameter and SDR of pipe. Table 5 details the corresponding code numbers for approved weak links.

Table 4 Recommended DCD Weak-Link System for 1-1/4" Through 6" Medium Density PE Gas Pipe

Pipe Size (MDPE 2406 gas pipe)	SDR	OD	Minimum WT	Maximum Pulling Force (Pounds)	Recommended Pins for Weak-Link System (DCD 5 Pin System) ¹	Weak-Link Failure Load (Pounds ±5%)
		(Inches)				
1/4" CTS PE 3408/4710	6	0.375	0.062	70	Not Available	NA
1/2" CTS	7	0.625	0.090	150	Not Available	NA
1" CTS	11.5	1.125	0.099	320	Not Available	NA
1-1/4" IPS	10.0	1.660	0.166	800	1–750-Pound Pin	750
2" IPS	11.0	2.375	0.216	1,500	1–1,500-Pound Pin	1,500
3" IPS	11.5	3.500	0.304	3,100	4–750-Pound Pins or 2–1,500-Pound Pins	3,000
4" IPS	11.5	4.500	0.391	5,200	Do not install this SDR.	NA
4" IPS	13.5	4.500	0.333	4,500	3–1,500-Pound Pins	4,500
6" IPS	11.5	6.625	0.576	11,300	Do not install this SDR.	NA
6" IPS	13.5	6.625	0.491	9,800	4–2,000-Pound Pins and 1–1,500-Pound Pin	9,500
8" IPS	13.5	8.625	0.639	16,600	See Footnote 2	

¹ See the manufacturer's instruction sheet for the recommended locations for pin installation.

² Contact the Plastic Hotline at Company phone number 223-9161 for information about the mechanical weak-link system for 8" PE pipe.

Table 5 DCD Mechanical Weak Links

Description	Pin Color Code	Code ¹
Series 00560 Connector Body	NA	203751
750-Pound Pin	Yellow	203750
1,500-Pound Pin	Red	203748
2,000-Pound Pin	Blue	203749

¹ There are 5 pins in each pack.

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Plastic Gas Distribution System Construction and Maintenance

(a) General

- (i) The Series 00560 breakaway connector is made up of six basic components, as shown in Figure 2 below. The breakaway pins can be assembled in any configuration, provided they are installed in a symmetrical pattern. Separation will occur at the value equal to the sum of the pin values.
- (ii) An overload condition **will** cause the breakaway connector to separate and release the stored energy of the duct, rope, chain, or cable. Make sure that all components of the pulling system are able to withstand the maximum pulling loads. Components not rated for the pull force may break and release the stored energy. Never use a worn, defective, or incomplete component.
- (iii) **Use breakaway pins only once.** Elongation or stretching of the pins may occur during the first use.

(b) Installation

- (i) To install the pins in the unit, first select the required break value. Refer to Table 4 on Page 5 to select the proper pin combination.
- (ii) Ensure that all the parts are clean. Insert the pin chamber into the body. Place the alignment pin into the small drilled hole.
- (iii) Screw the required breakaway pins into the proper locations.

WARNING: Do not over tighten the pins. Ensure that they are installed in a symmetrical manner. Failure to do this may result in distorted values.

- (iv) To remove broken pins, unscrew the broken end out of hole using a Phillips screwdriver pressed firmly into the hole of each pin.

(c) Operation

- (i) The DCD Series 00560 breakaway connector must not be used if the pulling mechanism functions in a counterclockwise rotation because the connector will loosen its assembled condition.
- (ii) Always use a swivel between the breakaway connector and the pulling mechanism to avoid severe damage to the connector and the extreme likelihood of personal injury.

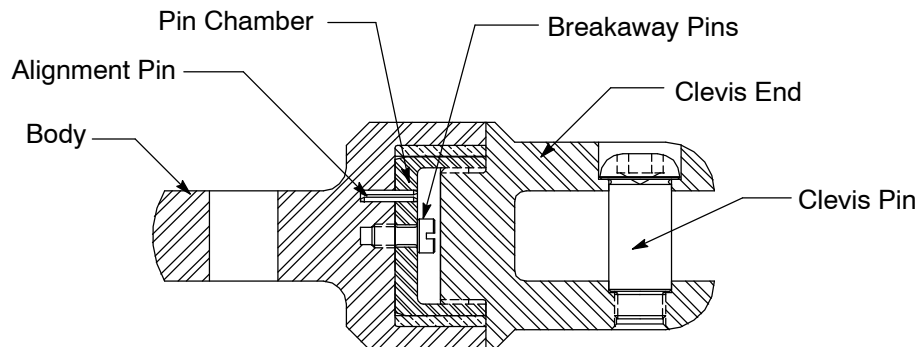


Figure 2
DCD Series 00560 Breakaway Connector

Thermal Load Considerations

6. Do not install PE pipe so that it is under tension. Make allowance for thermal contraction when PE pipe is installed on a warm day, otherwise the PE pipe will be under tension when it cools. This is particularly important when performing insert work, since there is little restraint on the PE pipe due to the lack of soil loading.
 - A. For direct burial where clearance from other facilities is not a problem, snake the pipe within the trench to provide excess length. Backfilling the trench when the pipe is cool is recommended. This minimizes stress caused by the thermal contraction.
 - B. At tie-in locations, cut the pipe long enough so that the tie-in fittings are in compression when installed. Whenever possible, make the tie-ins during the cooler part of the day, after the pipe has cooled to ground temperature. For maximum effectiveness, permit the pipe to cool overnight and make the tie-in in the morning. This is particularly important for insert construction of straight sticks of pipe.

Hyperlinks Are Inactive
Plastic Gas Distribution System
Construction and Maintenance

C. If the pipe is restricted, tensile pulling forces can damage the pipe or cause undesired loads on the pipe and fittings. Determine the amount of thermal contraction by using the following formula:

$$\text{Contraction (inches)} = \frac{TD \times L}{1,000}$$

Where TD = temperature drop (°F)
 L = length of plastic pipe (feet)

Direct Burial

7. Ensure that plastic main installed using direct-burial construction or HDD has a minimum of 2' of cover. Ensure that plastic services are installed with a minimum of 18" of cover. Services may be installed at a depth of not less than 12" of cover on private property. For joint trench construction, follow the provisions of [Utility Standard S5453](#). Do not install direct-buried plastic pipe beneath retaining structures, walls, or footings, or adjacent to pile or other structures subject to settlement. Plastic piping should not be installed in unpaved areas where substantial wheel or equipment loading may damage the pipe, unless approved by the area senior gas operations engineer.
8. Plastic pipe is susceptible to buckling and crushing at specified depths due to the effects of soil stresses. Plastic pipe may not be installed at a depth greater than 10' unless the installation is evaluated for fill-stress effects and is approved by the area senior gas operations engineer.
9. Install the PE pipe in the trench so that there are no bends with a radius less than 20 times the pipe diameter, and no fusion or mechanical joints within 3' of any bend.

Table 6 PE Pipe Minimum Bend Radius

Nominal Pipe Size (Inches)	Minimum Bend Radius for PE Pipe Unsupported by Casing (Feet)
1/2 CTS	1
1 CTS	2
1-1/4 IPS	3
2 IPS	4
3 IPS	6
4 IPS	8
6 IPS	12
8 IPS	15

10. Ensure that plastic pipe containing fusions or mechanical joints is installed in a straight alignment. Plastic pipe installations are in a straight alignment if the bend radius of the pipe is greater than 150 times the pipe diameter.
11. When installing PE using HDD, minimize variations in the bore to avoid adding drag when pulling back the pipe. Proper back-reaming and mudflow will help reduce the drag on PE when pulling back the pipe.

Joining

12. Only approved methods of heat fusion, electrofusion, or approved mechanical fittings shall be used to join PE pipe (see Utility Work Procedures [WP4170-04](#), [WP4170-05](#), [WP4170-06](#), [WP4170-07](#), and [WP4170-08](#)).

A. The preferred methods of joining for each size pipe are shown in Table 7 below and Table 8 on Page 8.

Table 7 Preferred PE Pipe Joining Method for Routine Construction

Pipe/Tubing Size	Joining Method
1/4" CTS	Compression Mechanical Fittings Only
1/2" and 1" CTS	Mechanical Fittings ¹ or Socket Fusion
1-1/4" and 2" IPS	Stab-Type Mechanical Fittings or Socket Fusion
3" IPS and Larger	Butt Fusion

¹ Compression or stab-type

Hyperlinks Are Inactive
Plastic Gas Distribution System
Construction and Maintenance

Table 8 Preferred PE Pipe Joining Method for Tie-In and Repairs

Pipe/Tubing Size	Joining Method
1/4" CTS	Compression Mechanical Fittings Only
1/2" and 1" CTS	Mechanical Fittings ¹ or Socket Fusion
1-1/4" and 2" IPS	Socket Fusion, Electrofusion, Mechanical Fittings ¹
3" IPS and Larger	Butt Fusion and Electrofusion Fittings

¹ Compression or stab-type

Electrofusion couplings can also be used to join pipe. However, due to their high installation cost, it is recommended that they be used only for repair and tie-ins.

- B. Only qualified employees may make joints using heat-fusion joining techniques. The methods of heat-fusion joining are outlined in Utility Work Procedures [WP4170-04](#), [WP4170-05](#), [WP4170-06](#), and [WP4170-07](#). Employee qualification procedures are specified in [Numbered Document D-34](#).
- C. For PE-to-PE mechanical connections, use the approved mechanical fittings shown in Numbered Documents [B-90.1](#), [B-91](#), or [B-91.1](#) as appropriate.
- (1) Use the proper installation procedures. This includes, but is not limited to, squaring the ends of the pipe, removing burrs, and inserting a metal stiffener in the pipe. Follow all the manufacturer's instructions.
 - (2) Ensure that no joints will be under tension when the pipe cools. This is particularly important for insert construction where the pipe is free to move inside the casing as the temperature changes. (See Item 6 on Page 6.)
 - (3) Verify that the fitting is installed properly. The pipe must be fully inserted into the fitting. Use the proper stab-depth markings as guidelines. Tighten the fittings properly with compression nuts. The stiffener must extend past the area under the compression gasket.
- D. Make PE-to-steel, PE-to-copper, or PE-to-cast-iron transition joints using the approved transition fittings shown in Numbered Documents [B-54](#), [B-90](#), [B-91](#), [B-91.1](#), [B-91.4](#), or [B-91.5](#) as appropriate.
- (1) Except for service head adapters, heat-fusion transition fittings are preferred for 1-1/4" and larger plastic-to-steel transitions.
 - (2) Take precautions to protect the PE pipe at the point of transition.
 - (a) Never shorten the steel portion of a transition fitting. Heat from welding may damage the PE pipe if the steel is cut.
 - (b) Protect the transition joints from excessive heat. Do not weld, cad-weld, or heat the body of the fitting; only butt welding of the steel end is permitted. During this welding, protect the PE part of the heat-fusion transition fitting from overheating by wrapping the midpoint of the steel part of the fitting with wet cloth to remove heat. Keep the cloth wet. After completing the weld, leave the wet cloth on the fitting until the steel pipe is cool enough to touch.
 - (c) Adequately support the plastic pipe adjacent to the transition fitting.

In the case of service inserts, the protective sleeve should span the gap between the transition fitting (or plastic fitting) and the casing. Support the exposed PE pipe with well-compacted sand or fine soil.

It may be necessary to use snug-fitting, telescoping sleeves if the protective sleeves will not fit over or inside the casing pipe.

Protective Sleeving

13. Install protective sleeves on all the service connections if the sleeve is packaged with the fitting. Install the sleeves per the manufacturer's instructions. Ensure that the sleeves are supported by well-compacted soil.
14. Install protective sleeves if the PE pipe exits a metal casing.

Cathodic Protection

All steel portions of a plastic pipe system (steel valves, steel risers, and other pressurized steel components) must be cathodically protected. Prefabricated risers, metallic components on approved plastic valves, and metallic bolts on plastic fittings need not be protected. Refer to [Section O of the Gas Standards and Specifications](#).

Test Requirements

15. Follow the test requirements outlined in [Numbered Document A-34](#) and the limitations specified in [Numbered Document A-93](#). The minimum test duration at 100 psig is 5 minutes and the maximum cannot exceed 8 hours.



Do not use the squeeze-off technique to separate gas and air during an air test.

- A. If a new main or service has been installed and tested as described in [Numbered Document A-34](#), but will not be immediately tied in to an existing system, the new main or service shall remain pressurized with air at 60 psig or less.
- B. PE pipe is subjected to a field leak test that only tests the tightness of the system, rather than a strength test that tests the mechanical strength of the system. Therefore, a leak test may not identify any deficiencies in the strength caused by construction problems.
- C. Do not perform a leak test on PE pipe with a surface temperature above 100°F.

Backfill

- 16. Backfill must provide firm, continuous support under and around the pipe, and provide support for spans across gaps and holes. It must be free of sharp objects, rocks, and large clods. The backfill materials used for support must be well-compacted. To prevent differential settlement, take extra care to provide proper compaction under pipes and fittings at branch and transition locations. Provide bedding for the pipe if the trench bottom is not smooth (refer to [Engineering Guideline 4123, "Backfill Sand Specification"](#)).
- 17. Compact the backfill at the sides of the PE pipe. Do not compact the backfill directly over the pipe until there is at least 12" of cover. Take care when dumping backfill material on top of PE pipe service connections or transition fittings.
- 18. If using a flowable fill, such as controlled density fill or slurry, provide a minimum of 4" of sand shading above and between the pipe and fittings. Owing to potential heat damage, cement additives such as calcium oxide (quick lime) shall not come into contact with PE pipe, tubing, or fittings.

Purging

- 19. Purge plastic mains and services according to the provisions specified in [Numbered Document A-38](#) or [A-38.2](#), as applicable.
- 20. Remove static-electric charges by grounding the pipe whenever the pipe is squeezed. Refer to Figure 3 on Page 10 and the instructions below to properly ground plastic pipe before purging. To ground the pipe:
 - A. Wrap the pipe in wet, soapy rags made of burlap or other non-synthetic material. Keep the rags wet with a soap solution at all times.
 - B. Place the grounded squeezer on the main.
 - C. Wrap wet, soapy rags around the pipe at all locations where static buildup is possible.
 - D. Attach one end of the ground cable to a grounding device that is grounded in wet earth. Bind the rags with the other end of ground cable. When purging a system from a main or a stub service, ground the pipe at both the purge end and at the squeeze point. Do not touch the pipe during or immediately after the purge except where it is covered by the grounded wet rags.
 - E. Ground all metallic cutting tools and fittings before they contact the PE pipe.
 - F. Consider the stub length and ensure that trapped gas may be safely released from the bell hole.

Squeezing

- 21. PE pipe is flexible and can be squeezed shut without damaging the pipe or reducing its pressure rating, provided the proper tools and procedures are used. Do not squeeze the pipe more than once at the same point. If it needs to be squeezed again, move the squeezer at least three pipe diameters away from the initial squeeze point, fitting, or fusion. See [Utility Work Procedure WP4170-02](#) for squeezing procedures and requirements.

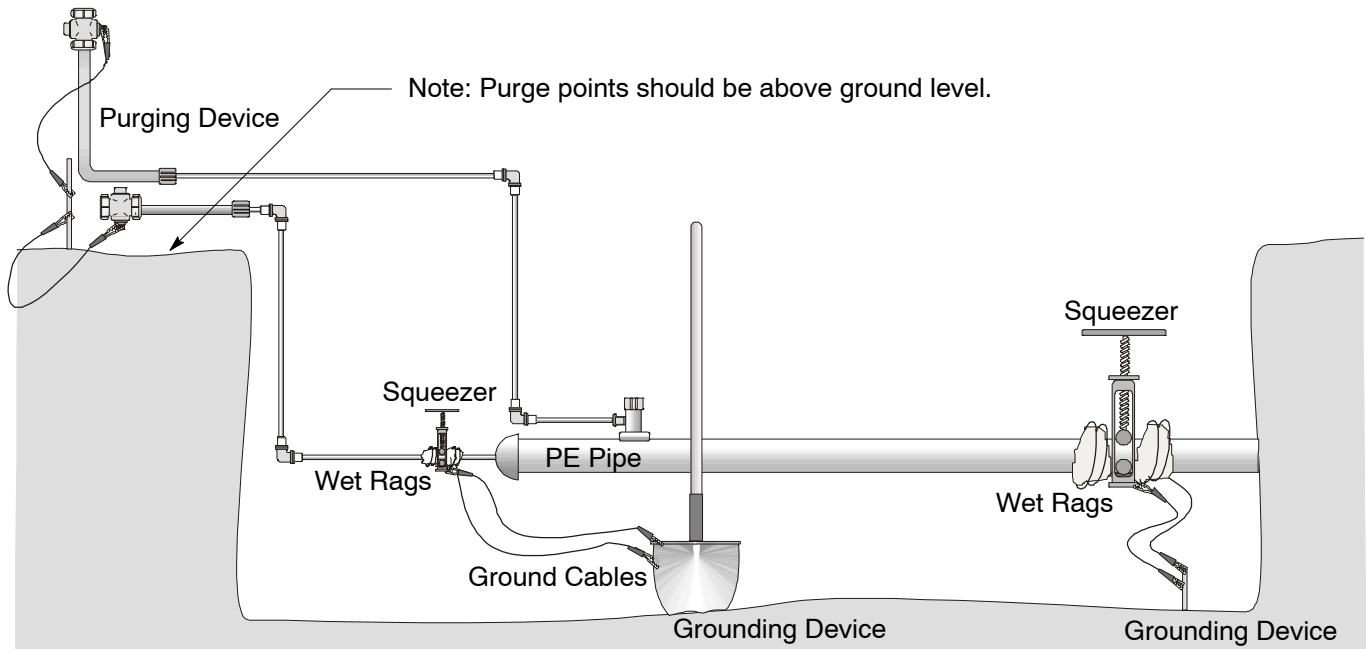


Figure 3
Approved Grounding Illustration

Static Electricity

22. Static-electric charges may build up on both the inside and outside surfaces of the PE pipe. Localized, static-electric buildup occurs because PE pipe does not readily conduct electricity. These charges are generated either by physically handling the pipe or by the high-velocity flow of gas through PE mains and services (e.g., venting, purging, or gas flowing through a restriction). The discharge of static electricity can cause shocks or ignite a gas-air mixture.

Whenever a pipe is squeezed, remove the static-electric charges by grounding the pipe at the squeeze point. Also ground the pipe during hot-tapping, purging, and leak-repair operations. To ground the pipe, wrap it with wet, soapy rags made out of burlap (Code 562001) or other non-synthetic material. Keep the rags wet with a soap solution at all times. See [Utility Work Procedure WP4170-01](#) for static-grounding procedures and requirements.



CAUTION

In all situations where gas is present or anticipated, provide static grounding.

Gauging Requirements/Continuity of Service

23. Pressure gauges shall be installed before closing main valves, squeezing off plastic, or stopping the flow of gas in any way. Pressure gauges shall be installed on the sections of the pipe which must be used to maintain service to customers. It is essential that pressure gauges be installed on **both** sides of the closure.
24. Pressures Must Be Carefully Watched
- A. After the line has been closed off, pressures shall be observed long enough before a main is cut to enable the responsible employee to determine that adequate pressure levels will be maintained during the time required for the shutdown.
 - B. The pressure gauges shall be monitored by the responsible employee while the job is in progress to see that pressure levels remain satisfactory.
 - C. Particular care shall be exercised by the responsible employee to maintain adequate pressure levels when purging the low-pressure main extensions.

Hyperlinks Are Inactive
Plastic Gas Distribution System
Construction and Maintenance

25. Coordination of Work

- A. When it becomes necessary to control pressures or operate valves, the work shall be performed by or under the immediate supervision of qualified M&C personnel. He/she shall ensure that proper safeguards are established and correct procedures are followed.
- B. Establishing or re-establishing customer service shall be performed by qualified personnel only.

Repairs

26. A full-encirclement, stainless-steel clamp may be used temporarily to repair punctures or longitudinal-type damage. Given these clamps do not have an internal stiffener, permanent repairs must be made within 30 days. Follow the applicable grounding procedure.

27. Permanent Repairs

- A. Make permanent repairs by replacing the damaged segment of plastic pipe. Note the following exception:
 - (1) Repair punctures or gouges deeper than 10% of the pipe wall by fusing a service saddle or tapping tee over the center of the hole. Do not fuse a service saddle or tapping tee onto a main when gas is present. Ground, squeeze, and purge the main in accordance with this numbered document. Ensure that the tap eliminates the puncture or gouge. Install a capped nipple on the outlet of the service saddle or tapping tee.
- B. Before placing in service, test segments of plastic pipe that are installed to replace damaged sections of mains and services according to the provisions in [Numbered Document A-34](#). Soap test mechanical fittings, visible pipe, and couplings after leak testing. Soap test the squeeze area after the repair is complete. After completing the work, thoroughly rinse any areas exposed to detergents with clear water.
- C. Clamp the exposed squeeze points on all 1-1/4" and larger Aldyl-A pipe with PVC, full-encirclement support clamps. The support clamps only provide support and are not intended for leak repair.

Table 9 below provides information on PVC support clamps (Aldyl-A pipe squeeze point only).

Table 9 PVC Support Clamps

Size (Inches)	4" Wide Code	6" Wide Code
1-1/4	024124	-
2	033924	020588
3	033925	020627
4	033926	020628
6	-	020631

28. Repair and Test Requirements for PE Pipe Damaged by Dig-In or Other Causes

Note: Only those individuals trained and qualified pursuant to PG&E's Operator Qualification program may perform leak tests.

- A. PE Pipe Not in a Casing

Visually inspect the plastic pipe upstream and downstream from the area of contact. Replace only enough pipe to make a permanent repair. Use pretested plastic piping. Leak test the replaced section according to the instructions in [Numbered Document A-34](#).
- B. Plastic Pipe Inserted Into an Existing Casing

If the casing is damaged (broken, bent, or crushed), replace the plastic carrier pipe 2' upstream and downstream of the dig-in location. Leak test the replaced section and all the piping according to the instructions in [Numbered Document A-34](#). Cut back the casing pipe 1' from the plastic pipe tie-in points. Install casing plugs and sleeves where the plastic exits and enters the casing.
- C. If, in a dig-in situation on a plastic service other than a low-pressure service, it appears that the pipe or casing was pulled or moved, and that damage could have occurred at locations along the service other than those inspected or repaired, leak test the entire service at 100 psig for a minimum of 5 minutes per the instructions in [Numbered Document A-34](#). Leak test low-pressure services at 10 psig for a minimum of 5 minutes per the instructions in [Numbered Document A-34](#). If additional damage is found, rerun the service.
- D. Note that service lines must be pressure tested from the point of disconnection to the riser.

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Plastic Gas Distribution System
Construction and Maintenance

29. Repair Requirements for Plastic-Service Inserted Risers or Prefabricated, Noncorrosive Risers for Meter Sets Exposed to or Damaged by a Fire or Excessive Heat

- A. Plastic pipe is sensitive to heat. When a plastic-service inserted riser or prefabricated, noncorrosive riser may have been subjected to unusually high temperatures (such as being exposed to a house fire or meter fire), replace either the plastic insert or the entire riser.
- B. Pressure testing the service is not sufficient. The plastic piping inside the riser could still be damaged even though the pipe may hold during a short duration leak test. If the service is used on a long-term basis, it could eventually rupture.

Records

30. The brand name of all plastic pipe lots installed at each location and the date it was manufactured shall be recorded in the permanent records. This may require multiple plastic stamps for construction drawings. Figure 4 depicts a sample plastic stamp for construction drawings. Note the pipe’s brand and manufacturing date (MM/DD/YY format) on the foreman’s copy of the completed estimate. Transcribe this to the file copy. Record the brand and manufacturing date (MM/DD/YY format) of pipe used for service installations in the “Remarks” section of the [“Gas Service Record.” Form F5458-1](#), or the [“Leak Survey, Repair, Inspection, and Gas Quarterly Incident Report \(Form “A”\).” Form 62-4060](#), as appropriate. See [Attachment B](#) to Numbered Document A-93 for print line information.

PLASTIC PIPE INSPECTION/DATA	
FOOTAGE AND SIZE	_____ / _____
PIPE MANUFACTURER	_____
DATE MANUFACTURED	_____
<input type="checkbox"/> PE 2406 (YEL)	<input type="checkbox"/> PE 3408 (1/4"CTS)
FOOTAGE AND SIZE	_____ / _____
PIPE MANUFACTURER	_____
DATE MANUFACTURED	_____
<input type="checkbox"/> PE 2406 (YEL)	<input type="checkbox"/> PE 3408 (1/4"CTS)
FOOTAGE AND SIZE	_____ / _____
PIPE MANUFACTURER	_____
DATE MANUFACTURED	_____
<input type="checkbox"/> PE 2406 (YEL)	<input type="checkbox"/> PE 3408 (1/4"CTS)
LIST ALL PLASTIC PIPE BY FOOTAGE, SIZE, MANUFACTURER AND DATE MANUFACTURED PER STANDARD A93.1	

Figure 4
Plastic Pipe Stamp

Revision Notes

Revision 08 has the following changes:

1. Added the Horizontal Directional Drilling Manual to the “References” section.
2. Deleted all references to the Gas Distribution and Technical Services department.
3. Clarified that Attachment B to Numbered Document A-93 lists the approved manufacturers and plants.
4. Deleted references to 1/4” CTS yellow HDPE tubing.
5. Added a caution on Page 2.
6. Clarified that a double insert is permissible.
7. Deleted the requirement in Item 7 on Page 7 that the senior gas operations engineer approve shallow cover installations.
8. Edited Table 7 on Page 7 to include the stab-type mechanical fittings for 1-1/4” and 2” IPS pipe sizes.
9. Edited Table 7 on Page 7 and Table 8 on Page 8 to specify only the compression mechanical fittings for 1/4” CTS tubing connections.

Hyperlinks Are Inactive
Plastic Gas Distribution System
Construction and Maintenance

10. Added identical Footnote 1 to Table 7 on Page 7 and Table 8 on Page 8.
11. Updated the references in Item 12C on Page 8.
12. Added PE-to-copper joints to Item 12D on Page 8.
13. Replaced the “Squeeze Requirements” and “Static Electricity” sections with “Squeezing” on Page 9, “Static Electricity” on Page 10, and “Gauging Requirements/Continuity of Service” on Page 10 sections.
14. Specified a 30-day limit on temporary repairs in Item 26 on Page 11.
15. Added a reference to Attachment B of Numbered Document A-93 in Item 30 on Page 12.