



Purpose and Scope

This Gas Design Standard (GDS) provides use and design information for selecting, installing, and documenting polyethylene (PE) and steel Excess Flow Valves (EFV). Supplements to this GDS may be found in the manufacturer's product manuals and catalogs, and in the documents listed in the ["References"](#) section.

General Information

1. Only personnel qualified as described in [GDS D-34, "Qualifications for Joining Plastic Pipe"](#) may install a polyethylene (PE) excess flow valve (EFV).
2. Only personnel qualified as described in [GDS D-22 "Arc Welding Procedure Requirement"](#) may install a steel EFV.
3. The size of the EFV and service piping must be the same size unless an exception is granted by the document owner.
4. Steel EFVs are contained within a stick of $\frac{3}{4}$ " steel pipe or 1" steel pipe with $\frac{3}{4}$ " x 1" welded reducer (1800 series), and will carry cathodic protection current normally once welded in place.
5. DO NOT squeeze an EFV.
6. DO NOT cut a steel EFV to reduce to its length.
7. Steel EFVs are constructed with Grade B $\frac{3}{4}$ " nominal pipe size (NPS) Schedule 40 steel pipe (ASTM A53) and the ends are beveled for welding.

Applications for EFVs

1. EFVs must be installed on all new, replaced, repaired, altered, and transferred services in any of the following situations:
 - A single service line to one single family residence (SFR)
 - A branched service line to a SFR installed concurrently with the primary SFR service line (i.e., a single EFV may be installed to protect both service lines)
 - A branched service line to a SFR installed off a previously installed SFR service line that does not contain an EFV
 - Multifamily residences with known customer loads not exceeding 1,400 scfh per service

Applications for EFVs (continued)

- A single, small commercial customer served by a single service line with a known customer load not exceeding 1,400 scfh
2. IF a service is outside the scope in [Step 1](#), above and an EFV is not installed, THEN a curb valve may be required. See [GDS A-43.2, "Curb Valve Installations, Distribution Systems."](#)
 3. DO NOT install an EFV if:
 - The EFV is not required by Table 1, "EFV and Curb Valve Requirements – System Maximum Allowable Operation Pressure (MAOP)."

Table 1. EFV Requirements – System Maximum Allowable Operation Pressure (MAOP)

System MAOP	EFV Required
<10psig	No
≥10 psig and ≤60 psig	Yes
≥60 psig	No

- The repair or alteration occurs more than 3 feet from the main, except for service stub completions.
- The repair or alteration does not require the service to be disconnected from the main (e.g., tee cap replacement).

EFV Selection Instructions

1. Determine if the proposed new or replaced service requires the installation of an EFV as described in Section ["Applications for EFVs."](#)
2. Size the EFV based on the load equal to the maximum continuous capacity of the meter listed in [GDS J-10.1, "Diaphragm Meter Capacities"](#) and [GDS J-20, "Rotary Meter Capacity – At Standard and Elevated Delivery Pressure."](#) Take delivery pressure into account when determining the maximum continuous capacity.
3. IF needed, THEN use total connected load per [Utility Procedure TD-9500P-10, "Customer Load Study,"](#) and service length. Use the total connected load to select the proper size and flow model EFV using [Table 2, "Polyethylene EFV Selection by Total Connected Load and Service Length,"](#) or [Table 3, "3/4" Steel EFV Selection by Total Connected Load and Service Length."](#) Anticipate future increases in load to be considered when sizing an EFV for a new service.

4. Steel services requiring an EFV should be replaced with plastic, if practical per [Utility Standard TD-4801S, "Service Replacement Criteria."](#) If a replacement with plastic is not practical, a steel EFV may be installed per [Table 3](#).
5. Steel EFVs are currently available in ¾" NPS size, and must only be used on ¾" steel services. Steel services of other sizes that require an EFV must be replaced with plastic.

Table 2. Polyethylene EFV Selection by Total Connected Load and Service Length ¹

Length (ft) ²	Total Connected Load (scfh)						
	0-385	386-595	596-700	701-990	991-1620	1621-2340	2341-5000
0-28	½" - 400 1" - 800	½" - 600 1" - 800	½" - 800 1" - 800	1" - 1100	1" - 1800	1¼" - 2600	2" - 5500
29-45	½" - 400 1" - 800	½" - 600 1" - 800	1" - 800	1" - 1100	1" - 1800	1¼" - 2600	2" - 5500
46-122	½" - 400 1" - 800	1" - 800	1" - 800	1" - 1100	1" - 1800	1¼" - 2600	2" - 5500
123-261	1" - 800	1" - 800	1" - 800	1" - 1100	1¼" - 2600	1¼" - 2600	2" - 5500
262-960	1" - 800	1" - 800	1" - 800	1¼" - 2600	1¼" - 2600	1¼" - 2600	2" - 5500
961-1000	1" - 800	1" - 800	1" - 800	2" - 5500	2" - 5500	2" - 5500	2" - 5500
1001-2560	2" - 5500	2" - 5500	2" - 5500	2" - 5500	2" - 5500	2" - 5500	2" - 5500

1 Contact document owner for guidance on services beyond the scope of this table. Table based on 10 psig main pressure (APD minimum design pressure).

2 The length for a branch service is equal to the distance from the main to the farthest meter.

Table 3. ¾" Steel EFV Selection by Total Connected Load and Service Length ¹

Length (ft) ²	Total Connected Load (scfh)			
	0 - 700	701 - 990	991 - 1620	1621 and higher
0 - 51	Steel 800 Series	Steel 1100 Series	Steel 1800 Series	Install new plastic service
52 - 92	Steel 800 Series	Steel 1100 Series		
93 - 329	Steel 800 Series			
329 and longer				

1 Contact document owner for guidance on services beyond the scope of this table. Table based on 10 psig main pressure (APD minimum design pressure).

2 The length for a branch service is equal to the distance from the main to the furthest meter.

6. For new or fully replaced service lines, the maximum service length for each size pipe and EFV is shown in [Table 4, “EFV Capacities and Maximum Service Lengths.”](#) For reconstruction work on a system whose MAOP is greater than 25 psig and minimum normal operating pressure (NOP) of 24 psig see [Attachment 1 “EFV Capacities and Maximum Service Lengths for Systems with MAOP greater than 25 psig.”](#)
7. When sizing an EFV for an existing service that will not be replaced, choose an EFV with adequate capacity for the customers load. If the service length is too long for the available EFVs, choose the EFV which provides the greatest length of protection. (This will provide partial protection of the service line). Note that service is “partially protected” in the notes section of the GSR.

Table 4. EFV Capacities and Maximum Service Lengths ¹

Size	EFV Brand and Series	Maximum Total Connected Load ² (scfh)	Maximum Service Length (ft)
½" CTS	Perfection 400	385	122
	Perfection 600	595	45
	Perfection 800	700	28
1" CTS	Perfection 800	700	1000
	Perfection 1100	990	261
	Perfection 1800	1620	122
1¼" IPS	Perfection 2600	2340	960
2" IPS	Perfection 5500	5000	2560

1 Based on 10 psig main pressure (APD minimum design pressure).

2 Combined load of all connected customer equipment that could operate simultaneously.

8. Fill out the EFV section of the Gas Service Record (GSR), per [Utility Procedure TD-9500P-14 “Gas Service Records.”](#)
9. EFV model descriptions and material code numbers are listed in [Table 5, “Model Descriptions and Material Code Numbers.”](#)

Table 5. Model Descriptions and Material Code Numbers

Size (Inches)	Flow Series	Maximum Pressure Drop (psig) ¹	Type of Valve Ends	Material Code
½ CTS	Perfection 400	0.75	Plain Pipe Ends	022896
			Socket Fusion	020947
	Perfection 600	1.90	Plain Pipe Ends	022929
			Perfection 800	1.40
		Socket Fusion	020949	
¾ NPS	Steel Perfection Medium Flow Series 800	1.40	Weld Ends	032155
	Steel Perfection Medium Flow Series 1100	3.00	Weld Ends	032168
	Steel Perfection Medium Flow Series 1800	3.20	Weld Ends	032169
1 CTS	Perfection 800	1.40	Plain Pipe Ends	022917
			Socket Fusion	020951
	Perfection 1100	3.00	Plain Pipe Ends	022918
			Perfection 1800	3.20
		Socket Fusion		
1¼ IPS	Perfection 2600	4.90	Plain Pipe Ends	022923
2 IPS	Perfection 5500	0.50	Plain Pipe Ends	022928
Extra Metal Tags for EFVs				020957

¹ This is pressure drop at maximum capacity, contact document owner for pressure drop at lower flow rates. Do not include EFV pressure drop for service sizing calculation under [Utility Procedure TD-9500P-11, "Gas Service Sizing."](#)

10. Refer to [Table 6, "EFV Installation and Replacement Matrix"](#) for installation scenarios.

Table 6. EFV Installation and Replacement Matrix

Scenario	EFV Installed	Action	Charge To
Customer requests new gas service, and a new single service is installed	No	Engineered job. Install a new EFV with the appropriate capacity	New Business
Customer adds load to a single service, and the service is completely replaced	Yes		
Customer adds load to a single service, and the service is altered to accommodate load	No	Check the EFV's capacity and replace it if the capacity is inadequate	WRO
	Yes		
Customer adds load, no service reinforcement work is performed	No	Install a new EFV if the alteration is within 3 feet of the service tee/saddle	WRO
	Yes		
Customer requests service to serve new or existing load and PG&E branches off an existing service	No	Check the EFV's capacity and replace it if the capacity is inadequate ¹	New Business
	Yes		
Customer requests service to serve the new or existing load, and PG&E installs a multi-meter manifold with one or more additional meters	No	Engineered job. Install a new EFV with the appropriate capacity on the mother service	New Business
	Yes		
Developer does a lot flop, and PG&E deactivates the old stub and installs new service at the new service point	No	Check the EFV's capacity and replace it if the capacity is inadequate ²	New Business
	Yes		
Customer requests an EFV on an existing service	No	Install a new EFV ²	NA
	Yes		
The EFV is leaking or has failed	No	Engineered job. Install a new EFV with the appropriate capacity	WRO ³
	Yes		
Customer requests an EFV on an existing service	No	Engineered job (service alteration). Install a new EFV ¹	WRO ³
	Yes		
GPRP, reliability, or capacity job where service is replaced as part of the job	No	Replace the EFV	Maintenance
	Yes		
GPRP, reliability, or capacity job where service is replaced as part of the job	No	Engineered job. Install a new EFV with the appropriate capacity	Capital Job
	Yes		
GPRP, reliability, or capacity job where service is transferred as part of the job	No	Install a new EFV or leave in place the existing EFV	Capital Job
	Yes		
GPRP, reliability, or capacity job where service is transferred as part of the job	No	Engineered job. Install a new EFV with the appropriate capacity	Capital Job
	Yes		

1 If the service size is increased to meet the EFV maximum protected service line limitation, bill the applicant under New Business or work at the request of others (WRO), as appropriate.

2 An EFV is required if the total connected load is less than 1,400 scfh.

3 Reimbursable WRO.

Table 6. EFV Installation and Replacement Matrix (continued)

Scenario	EFV Installed	Action	Charge To
Existing service cut off at property line by PG&E to facilitate work by customer, and reconnected later	Yes	Same load: leave current EFV	NA
		Added load: check EFV capacity and replace it if the capacity is inadequate	WRO ³
	No	No EFV installation is required	NA
Commercial customer requests service to serve new or existing load at or less than 1,400 SCFH	Yes	Engineered job. Install a new EFV with the appropriate capacity	New Business
Commercial customer increases load from at or less than 1,400 SCFH to more than 1,400 SCFH	Yes	Check the EFV's capacity and remove it if the capacity is inadequate	WRO ³
	No	No EFV installation is required	NA

1 If the service size is increased to meet the EFV maximum protected service line limitation, bill the applicant under New Business or work at the request of others (WRO), as appropriate.
 2 An EFV is required if the total connected load is less than 1,400 scfh.
 3 Reimbursable WRO.

EFV Field Installation Instructions

1. Install the EFV on the service line as follows:
 - Install the EFV as near as practical to the service tee. In most cases, an EFV with plain pipe ends may be connected directly to the service tee, but a short piece of pipe may be installed between the service tee and EFV as needed.
 - For a branch service, the EFV must be installed on the mother service and be of sufficient capacity to serve the combined total connected load of both residences.
 - For service lines fed by farm tap regulator sets, install the plastic EFV approximately 3 feet from the steel-to-plastic transition fitting downstream of the farm tap regulator set. Include an EMS marker with the EFV to allow for future locating in the event the EFV must be replaced or removed. See [GDS H-10, "High-Pressure Regulator-Type Stations and Farm Tap Regulator Sets."](#)
2. Remove debris from the service line before installing an EFV.

**CAUTION**

An EFV installed with the flow direction going the wrong way, will flow normally, but will not activate.

3. Install the EFV in a horizontal position and ensure the directional arrow is in line with the flow of the gas and pointing toward the gas meter.

Note: The EFV can be installed at an angle or in a vertical position when necessary if there is no debris that will interfere with the EFV.

4. Use an appropriate welding procedure when installing a steel EFV. When welding a steel EFV, place a wet rag over the center of the steel EFV stick while it is being welded in place. Keep welding heat away from the center of the EFV stick.
5. The EFV is supplied with a small metal identification tag and an adhesive sticker.
 - A. Use the nylon tie supplied to install the metal tag.
 - B. Install the metal tag on the gas service riser at the gas service valve location.
 - C. Install the adhesive sticker on the gas riser sun shield or pressure regulator.
 - D. For branch services, place the metal tag and adhesive sticker on the mother service. Follow [GDS A-42, "Standard Branch Service Installation,"](#) for additional branch marking requirements.
6. EFVs on new stub services are to be installed as close as possible to the gas main.
 - A. Leave the metal tag and adhesive sticker in the EFV plastic bag.
 - B. Wrap the bag around the buried stub.
 - C. Attach the tag and sticker at the riser when the service is completed.
 - D. Ensure a properly sized EFV is present when performing a stub completion, if required.
7. When completing an existing stub that is missing an EFV, or a customer requested EFV, install an EFV at the nearest non-paved point to the main, or at the property line. Place a note in the notes section of the GSR saying "EFV installed on stub completion".
8. Complete the EFV section on the GSR, per [Utility Procedure TD-9500P-14](#).

Leak Testing

1. Leak test EFVs as required in [GDS A-34, "Piping Design and Test Requirements."](#)
2. Increase the air pressure slowly when testing a service line with an EFV. A high flow may cause the EFV to trip.
 - For example: Take 15 seconds to pressurize a typical 50 foot – 100 foot service of ½" copper tubing size (CTS) or 1" CTS.
3. Depressurize the service at a slow flow rate to avoid tripping the EFV.

Purging Gas Services that have an EFV

1. Gas services with an EFV require a slower purge velocity than the normal gas purge procedure described in [GDS A-38, "Procedures for Purging Gas Facilities."](#)
2. Do not attempt to purge a main through a service with an EFV.
3. Confirm there is an EFV identification tag on the gas service valve, riser, the riser sun shield, or pressure regulator. If the tag is present, an EFV is installed on the service.
4. Open the gas service valve very slowly and only partially.
 - If the valve is fully opened, the resulting rapid flow of gas will activate the EFV.
 - The EFV may activate when purging to atmosphere even if the gas valve is opened slowly.
 - IF the EFV activates during purging,

THEN shut off the gas service valve and wait until the pressure equalizes before attempting to re-purge.
5. When performing service work downstream of the regulator at the meter set, removing a plug or associated piping too quickly can activate the EFV.
 - IF the EFV activates,

THEN shut off the service valve and wait for the pressure to equalize. A typical EFV takes approximately 5 minutes to equalize.

Target Audience

Gas planning, estimating, new business inspectors, gas distribution engineering and estimating, maintenance and construction, general construction, contracting, applicant design, materials inspect personnel. Personnel involved in PE and steel pipe connection training and qualification.

Definitions

Branch service	A service line that is not connected to a gas main, and has another service line as its source of supply.
Farm Tap Regulator Set	A pressure regulator set, including both single and multiple stages of pressure regulation, which controls pressure to a service line.
Maximum Continuous Capacity	The maximum flow rates at which the diaphragm meters should be operated on a frequent or continuous basis in standard cubic feet per hour (scfh). At standard delivery metering pressure of 7" WC, the maximum continuous capacity established by PG&E is based on the meter capacity with a 1.0" WC differential across the meter. At elevated gas metering delivery pressure of 1.0 psig and greater, the maximum continuous capacity at higher metering pressures is based on the meter capacity with a 2.0" WC differential pressure across the meter.
Total Connected Load	Total demand of all gas appliances operating simultaneously and at full capacity.

Acronyms and Abbreviations

APD:	Abnormal peak day
ASTM:	American Society for Testing and Materials
CFR:	Code of Federal Regulations
CTS:	copper tubing size
EFV:	Excess flow valve
EMS:	Engineering material specifications
GDS:	Gas Design Standard
GSR:	Gas service record
IPS:	Iron pipe size
NPS:	Nominal pipe size
PE:	Polyethylene
psig:	Pounds per square inch gauge
scfh:	Standard cubic feet per hour
WC:	Water column
WRO:	Work at the request of others

Compliance Requirement/Regulatory Commitment

Code of Federal Regulations (CFR) Title 49, Transportation, Part 192-Transportation of Natural and other Gas by Pipeline: Minimum Federal Safety Standards, Section 192.381, "Service lines: Excess flow valve performance standards."

Code of Federal Regulations (CFR) Title 49, Transportation, Part 192-Transportation of Natural and other Gas by Pipeline: Minimum Federal Safety Standards, Section 192.383, "Excess flow valve installation."

References

[Gas Design Standard A-34, "Piping Design and Test Requirements"](#)

[Gas Design Standard A-38, "Procedures for Purging Gas Facilities"](#)

[Gas Design Standard A-42, "Standard Branch Service Installation"](#)

[Gas Design Standard A-43.2, "Curb Valve Installations, Distribution Systems"](#)

[Gas Design Standard A-90 – Attachment 1, "Typical Direct-Burial Plastic Main and Service Installation"](#)

[Gas Design Standard B-91.1, "Polyethylene \(PE\) System Mechanical Fittings"](#)

[Gas Design Standard D-22, "Arc Welding Procedure Requirement – All Stress Levels"](#)

[Gas Design Standard D-34, "Qualifications for Joining Plastic Pipe"](#)

[Gas Design Standard H-10, "High-Pressure Regulator-Type Stations and Farm Tap Regulator Sets"](#)

[Gas Design Standard J-10.1, "Diaphragm Meter Capacities"](#)

[Gas Design Standard J-20, "Rotary Meter Capacity – At Standard and Elevated Delivery Pressures"](#)

[Utility Procedure TD-4170P-50, "Mechanical Fitting Connections for Polyethylene Pipe \(Stub Outlet\)"](#)

[Utility Procedure TD-9500P-10, "Customer Load Study"](#)

[Utility Procedure TD-9500P-14, "Gas Service Records"](#)

American Society for Testing and Materials (ASTM) F-1802, "Standard Test Method for Performance Testing of Excess Flow Valves"

American Society for Testing and Materials (ASTM) F-2138, "Standard Specification for Excess Flow Valves for Natural Gas Service"

Appendices

NA

Attachments

[Attachment 1, "EFV Capacities and Maximum Service Lengths for Systems with MAOP greater than 25 psig"](#)

Revision Notes

Revision 8 has the following changes:

1. Integrated all information from [Gas Design Standard A-45 "Steel Excess Flow Valves \(EFV\)."](#)
2. Removed Table 6 EFV color identification information located in the EFV Field Installation Instructions.
3. Removed the Perfection EFVs with Permasert Ends as described in [Utility Bulletin TD-4170B-013, "Discontinuation of Elster-Perfection Permasert Fittings."](#)
4. Added new code requirement that curb valves are required to be installed in accordance with [GDS A-43.2, "Curb Valve Installations, Distribution Systems,"](#) on any new service line or replace service line where an EFV is not installed.
5. Revised Attachment 1 removing field sizing information and incorporated [Utility Bulletin TD-A-93.3B-002, "Excess Flow Valve Sizing Guidance for High-Pressure Systems,"](#) which allows the use of 20 psig design pressure when sizing EFVs for specific scenarios.
6. Removed requirement that stated do not install an EFV if service is 3" or larger.
7. EFV installation locations updated for new and existing stub services.
8. Added Perfection EFVs with socket ends.
9. Added that on existing services, EFVs with adequate capacity may be installed with partial protection of the service line.

Asset Type: Distribution Services

Function: Design, Construction, Maintenance and Operation

Document Contact: [Gas Design Standard Responsibility List](#)